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August 19, 1960
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1960
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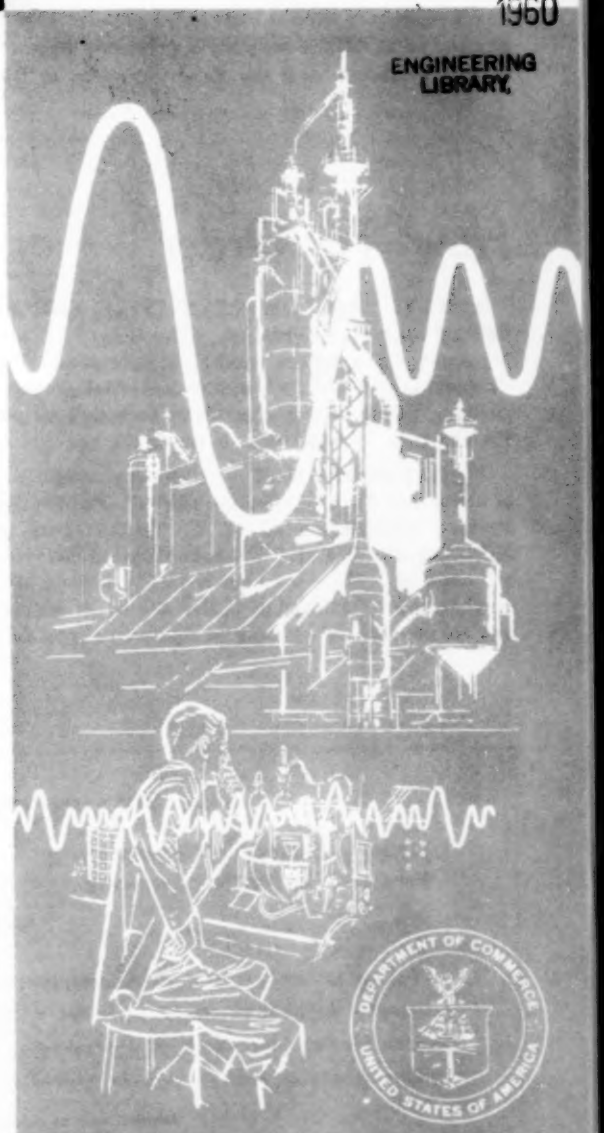

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Vol. 34, No. 2 Pages 115 - 243 Aug. 19, 1

AGRICULTURE

Pennsylvania State U. [University Park].
ANALYSIS OF METHODS AND EQUIPMENT FOR MEASURING SOIL MOISTURE, by Mark D. Shaw. Rept. on Contract DA 36-039-sc-78125. Jan 60, 64p. AD-232 841.
Order from LC mi$3.90, ph$10.80 PB 146 793

An outline is presented of the textural, structural, and chemical properties of soil as well as a discussion of the following aspects of soil moisture: hygroscopic and capillary moisture, gravitational water, field capacity, permanent wilting point, moisture equivalent, and plastic and liquid limits. Descriptions are included for chemical, electrical, gravimetric, lysimetric, nuclear, penetrometric, tension, thermal, and miscellaneous methods of measuring soil moisture. The literature survey combined with test work indicates that the most promising methods available for measuring soil moisture are those based on nuclear radiation and electrical resistance. The electrical resistance method is the simpler of the two. Additional work needs to be done on the development of sensing units and measuring instruments for accurate and reliable soil moisture measurements under all conditions and at all moisture levels. The appendices include discussions on the (1) effect of fertilizer concentration, temperature, and soil type on electrical resistance soil moisture instruments [from an unpublished manuscript by Shri Mohan Gupta of the Dept. of Electrical Engineering, Univ. of Penna., 1958]; and (2) response of electrical resistance soil moisture instruments at frequencies of 20 to 20,000 c.

ASTRONOMY

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
ASTRONOMICAL OBSERVATIONS BY MEANS OF HIGHLY SENSITIVE ELECTRONIC LIGHT INTENSIFICATION, by Lloyd R. Wylie (Wittenberg U.), Radames K. H. Gebel, and Lee Devol. Rept. on Research on the Quantum Nature of Light. Mar 60, 27p. 31 refs. WADC Technical note 59-404.
Order from OTS $2.75 PB 161 729

The advantages of observing and photographing celestial bodies with a light amplifier that employs the closed circuit television principle are explored and treated here. Special pickup tubes were developed to insure optimum performance. The electrical signals from the pickup tube are electronically amplified and modified. The image is reproduced by a cathode ray tube and photographs may be obtained from the screen of this tube. The electronic amplification of the electrical signal permits light intensification of 10^9 times. The modification of the signal makes almost complete suppression of the background possible. It permits astronomical observations during the day and also at night that are not possible with systems in which the background cannot be suppressed. Photographs of celestial bodies taken at the Weaver Observatory of Wittenberg University are included. (Author)

[Radio Corp. of America] Princeton, N. J.
THE LOW LIGHT LEVEL PERFORMANCE OF THE INTENSIFIER ORTHICON, by G. A. Morton and J. E. Ruedy. Rept. on Contracts AF 33(616)2631 and AF 33(616)3946. Mar 60, 19p. WADD Technical note 60-20.
Order from OTS $0.50 PB 161 701

This discussion of basic principles for development of the intensifier orthicon utilizes television techniques combined with preamplification from image converter principles. Fundamental factors influencing the investigation were: ability to obtain necessary gain of additional brightness by amplification of the pickup tube signal with a conventional video amplifier, secure long integration times with background suppression and better contrast, simplicity of multiple viewing and signal measurements. Performance of the tube, related equations, diagrams and photos are included. Quantitative relationships are drawn between contrast, brightness, and image definition for one-stage intensified orthicon and wide-spaced image orthicon. Simulated astronomical objects observed by methods described in this report show the significance of the intensifier orthicon. (Author)

Astrophysics

Army Signal Research and Development Lab., Fort Monmouth, N. J.
RADAR DETERMINATION OF THE SURFACE STRUCTURE OF THE MOON, by Fred B. Daniels. 1 Apr 60, 11p. 4 refs. USASRDL Technical rept. 2110.
Order from LC mi$2.40, ph$3.30 PB 146 937

The theory of radar reflections from a curved surface having random irregularities is developed and the application of this theory to radar echoes from the moon is discussed. The space correlation function measured at the earth's surface is found to have a similar form to that of the lunar surface, but a scale that is larger by a factor of approximately 500. Reasons are advanced for the choice of a Gaussian to represent this function, and the possibility of checking the validity of this assumption by making space diversity tests is discussed. The results of a preliminary experiment are described. (Author)

Center for Radiophysics and Space Research, Cornell U., Ithaca, N. Y.
SCIENTIFIC EXPERIMENTS FOR THE ARECIBO RADIO OBSERVATORY. Scientific rept. no. 2 on Contract AF 19(604)6158. 31 Mar 60, 64p. 29 refs. Research rept. RS 5; AFCRC-TN-60-359.
Order from LC mi$3.90, ph$10.80 PB 147 053

The feasibility of experiments inactive and passive radio astronomy is discussed. A priority list of experiments for the Arecibo Radio Observatory emerges, and the scheduling of these experiments is then discussed. Supporting theoretical and laboratory research is discussed.

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
BIBLIOGRAPHY OF EXTRATERRESTRIAL RADIO NOISE. FIFTH QUARTERLY LIST OF RECENT PUBLICATIONS, by Martha Stahr Carpenter. Rept. on Contract Nonr-401(22) and NSF Grant G5964. 15 Sep 58, 21p. 177 refs. Research rept. EE 414; AD-230 622.
Order from LC mi$2.70, ph$4.80 PB 146 094

This "Fifth Quarterly List" presents references to publications dealing wholly or in part with extraterrestrial radio noise. Most of the references pertain to material received at Cornell University between June 1, 1958 and September 1, 1958. Also included are certain references to earlier publications that were not mentioned in previous "Quarterly Lists," and a few revised statements of previously listed references about which further information is now available. The types of references included and the methods of finding them have been described in the preceding reports of this series. The list of journals that are thoroughly scanned in the search for pertinent publications has recently been greatly expanded.

Cruft Lab., Harvard U., Cambridge, Mass.
EMPIRICAL BASES FOR STATIONARY TIME SERIES, I, by W. C. Kellogg. Scientific rept. no. 2 on Contract AF 19(604)4979. 5 Oct 59, 18p. 2 refs. AFCRC TN-60-214; AD-232 539.
Order from LC mi$2.40, ph$3.30 PB 146 088

A brief review is presented of some properties of orthogonal function expansions, and a method is proposed for obtaining minimal sets of basis functions for the representation of sets of signals. The design of electronic equipment that will obtain basis functions and measure expansion coefficients by an analogue computing technique is discussed. An account is given of a numerical application of the technique of obtaining basis functions to time series consisting of daily sunspot counts. (Author)

Cruft Lab., Harvard U., Cambridge, Mass.
EMPIRICAL BASES FOR STATIONARY TIME SERIES, II, by W. C. Kellogg. Scientific rept. no. 3 on Contract AF 19(604)4979. 20 Nov 59, 15p. 2 refs. AFCRC TN-60-215; AD-232 540.
Order from LC mi$2.40, ph$3.30 PB 146 089

The procedure described (PB 146 088) for constructing as basis for a set of signals from samples of the signal set is studied for the case of a single continuous signal. It is found to be applicable provided the signal is a solution of an ordinary linear homogeneous differential equation with constant coefficients. When such a signal is represented in terms of a basis of functions derived from samples of the signal, the expansion coefficients depend upon the initial times of the samples and of the section of the signal being represented, and upon the frequencies and damping factors of the signal, but not upon the amplitudes and phases of the terms containing the various frequencies. (Author)

Manchester U. (Gt. Brit.)
STUDIES IN LUNAR TOPOGRAPHY. III. ERRORS INVOLVED IN THE PHOTOGRAPHIC DETERMINATION OF HEIGHTS AND A PRELIMINARY STUDY OF THE REGION OF PTOLEMAEUS AND ALPHONSUS, by Geoffrey Turner. Technical scientific note no. 3 on Contract AF 61(052)168. June 59, 35p. 10 refs. AFCRC-TN-59-612. AD-232 271.
Order from LC mi$3.00, ph$6.30 PB 146 133

A brief recapitulation of the cine photographic method is given and the errors arising from photographic and

seeing effects together with the measuring technique are discussed. The limitations, imposed by our present inadequate knowledge of basic selenographic coordinates are described and the need for further positional measures stressed. Heights are given for the eastern ramparts of the crater Ptolemaeus and the eastern ramparts and central mountain of the crater Alphonsus. (Author) (See also PB 146 132)

Visibility Lab., U. of California, San Diego.
THEORY OF ATTENUATION MEASUREMENTS IN PLANETARY ATMOSPHERES, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 8 8 Dec 58, 36p. 2 refs. SIO Reference 58-81; AD-212 699.
Order from LC mi$3.00, ph$6.30 PB 147 599

Two general methods are proposed for the determination of the volume attenuation function α in arbitrarily inhomogeneous spherical atmospheres. Each method is deduced directly from the equation of transfer of general radiative transfer theory, and is designed to take into explicit account the effects of the sphericity of the earth's atmosphere on radiometric measurements at high altitudes in the atmosphere.

BEHAVIORAL SCIENCES

Human Engineering

Dunlap and Associates, Inc., [Stamford, Conn.]
TRACKING TRAINING III: TRANSFER OF TRAINING, by Charles R. Kelley, Hugh M. Bowen and others. Rept. on Contract Nonr-1908(00). 25 Jan 60, 73p. 4 refs. Technical rept. NAVTRADEVCEN 1908-00-3.
Order from LC mi$4.50, ph$12.30 PB 146 878

Field studies indicate that there is a general carryover of training from one aircraft to another which, however, does not extend to the details of control skill. Present trainers can teach procedural and instrument skills but fail to teach particular control skills. These are usually learned by actual flying. Pilot studies indicate the following: (a) Transfer between different vehicular systems is high when instruments and controls are similar. Very stable high-order tracking systems seem to the operator to respond like lower order systems. (b) Stability seems to be the most important single variable in developing tracking skill. (c) In transferring from one- to two-dimensional control, there is a high positive transfer with a stable system, and some positive transfer with an unstable system. (d) The use of a predictor display is highly effective for principles training. Laboratory experiments indicated the following: (a) Six tracking conditions varying in stability and number of control dimensions were all effective in tracking training. The most effective condition employed variable stability while the poorest condition was the criterion system which was the most unstable. (b) General tracking training produces significant increases in skill in the control of systems having widely different dynamic characteristics.

Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus.
THE AMOUNT OF INFORMATION IN THE ABSOLUTE JUDGMENT OF MUNSELL HUES, by Donald W. Conover. Doctoral thesis. Rept. on Contract AF 33(616)3612, continuation of Contract AF 33(616)43. June 59, 56p. 49 refs. WADC Technical note 58-262.
Order from OTS $1.50 PB 161 699

Using surface colors provided by the Munsell 50-hue series of colored papers, the author developed a preliminary equal-discriminability scale for the absolute recognition of colors. Based on these data 16 colors were selected that represented an equally spaced series. This scale was validated with a second group of subjects. The results indicated that no adjacent pair of colors was confused with much greater frequency than any other pair. Both the initial and validating data indicate that the average color-normal individual can identify, on an absolute basis, nine surface colors. For practical coding purposes these results indicate that a maximum of somewhere between five and eight colors can be used, the exact number depending on how unfavorable the viewing conditions are expected to be and how large a proportion of the population must read the code without error. Theoretical and practical aspects of the results are reviewed. (Author)

Laboratory of Aviation Psychology, Ohio State U. Research Foundation, Columbus, Ohio.
A SUMMARY OF RESEARCH METHODS, OPERATOR CHARACTERISTICS, AND SYSTEM DESIGN SPECIFICATIONS BASED ON THE STUDY OF A SIMULATED RADAR AIR TRAFFIC CONTROL SYSTEM, by J. S. Kidd. Rept. on Contract AF 33(616)3612; continuation of AF 33(616)43. July 59, 33p. 25 refs. WADC Technical rept. 59-236.
Order from OTS $1.00 PB 161 741

This report summarizes fourteen laboratory studies of human engineering aspects of radar air traffic control systems. It includes a review of methodological developments and empirical findings. Human operator characteristics consistently observed in the task setting employed are presented, along with recommendations for system design and system management based on the experimental findings. Comments regarding the future potential of this type of research in dealing with significant human factor problems are also included. (Author)

Naval Medical Research Lab., New London, Conn.
THE SHAPE OF THE NORMAL WORK AREA, by Paul C. Squires. Rept. on Project NM 002 014.08.10. 23 July 56, 7p. 3 refs. Rept. no. 275.
Order from LC mi$1.80, ph$1.80 PB 147 033

The 'normal' work area, as represented by two intersecting semicircles, found in standard texts and human engineering manuals, is incorrect. A species of epicycloid curve is proposed as the correct and desirable contour for the normal work area; the parametric equations of this curve are given, based on anthropometric data. The epicycloid contour recommended would be useful in situations where instruments and visual displays must be arranged compactly and operator movement is relatively restricted. The proposed work area contour is natural and comfortable for the operator. (Author)

Pennsylvania State U., University Park.
HUMAN ENGINEERING INVESTIGATION OF AIRCRAFT COCKPIT VISUAL DISPLAYS. THE EFFECTS OF CONTRAST COLOR, AND VIEWING ILLUMINATION ON SCALE READING, by J. Lazo, E. Hendler and others. Rept. on Contract N156s-32041. 7 Feb 57; 36p. 2 refs. TED NAM AE-7047, Pt. 16; NAMC-ACEL-324; AD-129 108.
Order from LC mi$3.00, ph$6.30 PB 146 507

The research in this report concerns the effects on the time and accuracy of scale reading of (1) the contrast of dial marks with background; (2) the color of dial marks, white vs. red on black; and (3) the level of illumination under which scale readings are made, specifically, day vs. night levels. Legibility is described as accuracy of reading in time following the definition of Fitts. Another aspect of the research is that it is based on a large number of judgments with a small number of highly practiced subjects. (See also PB 136 724)

Pennsylvania State U., University Park.
HUMAN ENGINEERING INVESTIGATION OF AIRCRAFT COCKPIT VISUAL DISPLAYS. THE EFFECTS OF CONTRAST, COLOR, AND VIEWING ILLUMINATION ON THE LEGIBILITY OF LETTERS AND NUMERALS, by Alec J. Slivinske and Lloyd M. Crumley. Rept. on Contract N156s-32041. 27 Feb 57, 15p. 3 refs. TED NAM AE-7047, Pt. 16a; NAMC-ACEL-329; AD-129 107.
Order from LC mi$2.40, ph$3.30 PB 146 505

This experiment was conducted to investigate the effects of contrast, color, and viewing illumination on the legibility of printed letters and numerals. A previous study (PB 146 507) was made of the effects of the same variables on dial-scale reading. Taken together, the two studies provide some initial data on the effectiveness of interior color and lighting of cockpits on the legibility of dials and panel displays. (See also PB 146 507)

Personnel and Training

Adjutant General's Office, Washington, D. C.
RELATIONSHIP OF AFQT TO RATED BASIC TRAINING PERFORMANCE, by A. G. Bayroff, Leonard C. Seeley, and Alan A. Anderson. Feb 60, 14p. 1 ref. PRB Technical research note 106.
Order from LC mi$2.40, ph$3.30 PB 147 055

To evaluate the effectiveness of the Armed Forces Qualification Test (AFQT) in determining mental qualification for military service and to determine its usability for screening men on differential aptitude requirements of the Army, AFQT whole and part scores of 498 enlisted men in the 8th week of basic combat training were correlated with quality of performance as rated by fellow squad members and cadre. Total AFQT score correlated .44 with mean 7-point criterion rating. Validity coefficients of AFQT subtests had a range of .30 to .40, not appreciably different from that of Army Classification Battery tests used as reference variables for this study. No basic change in AFQT content was indicated. (Author)

Applied Psychology Panel, Office of Scientific Research and Development.
HUMAN FACTORS IN MILITARY EFFICIENCY; APTITUDE AND CLASSIFICATION. Summary technical rept. vol. 1, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 306p. 195 refs.
Order from LC mi$11.10, ph$47.10 PB 139 780

Contents:
Selection of military specialists
Classification of military personnel
Psychological principles in the development and evaluation of classification methods and devices.

Human Resources Research Office, George Washington U., Washington, D. C.
WHAT HUMRRO IS DOING, JULY 1948-JUNE 1959. Apr 60, 67p. 33 refs. Research Bulletin 7.
Order from LC mi$3.90, ph$10.80 PB 147 429

Using the methods of scientific research to improve the soldier's training, motivation, and leadership has been the mission of the Human Resources Research Office. The focus continues to be upon the human element amid increasingly complex instruments of war. This sixth issue of What HumRRO Is Doing reviews some of the work completed or under way during the 1959 fiscal year. It describes ways in which principles of learning have been applied to the practical problems of Army instruction, and in which experimental research techniques have contributed toward raising the soldier's proficiency and lowering the costs of his training in time and materiel. It also shows the dynamic manner in which factual data gathered during research programs may sometimes be applied successfully to practical situations while studies are still in progress.

Office of Naval Research, Washington, D. C.
TRI-SERVICE CONFERENCE ON JOB QUALIFICATIONS ANALYSIS, WASHINGTON, D. C., MAY 27-28, 1959. PROCEEDINGS. [1959] 74p. 12 refs. ONR Symposium rept. ACR-41, AD-233 145.
Order from LC mi$4.50, ph$12.30 PB 142 894

Contents:
Navy
- Naval organization for job qualifications research
- Enlisted job qualifications research
- Officer job qualifications research
- Qualifications analysis - the man side
- Job qualifications research on weapons systems not yet operational

Air Force
- Job qualifications analysis in the USAF
- The use of aptitude tests in the initial classification of Air Force military personnel

Army
- Army presentation on qualifications analysis
- Enlisted qualifications analysis
- Officer qualifications analysis
- Qualification analysis of aptitudes for Army jobs
- Qualifications analysis for training

Applied Mathematics and Statistics Labs., Stanford U., Calif.
BEHAVIORISTIC FOUNDATIONS OF UTILITY, by Patrick Suppes. Technical rept. no. 23 on Contract Nonr-225(17). 27 July 59, 29p. 18 refs. AD-225 157.
Order from LC mi$2.70, ph$4.80 PB 147 096

The extent to which behavioristic foundations can be supplied for utility is discussed. The fundamental assumptions are given of the stimulus sampling learning theory in terms of the concepts of stimulus, response, and reinforcement. This theory is then used to derive a utility function for various simple choice situations. This derived utility function is for stochastic choice behavior. The results are then related to the concept of entropy of Shannon (The Mathematical Theory of Communications. Univ. of Ill. Press, Urbana, 1949) and to the choice axiom of Luce (Individual Choice Behavior, Wiley, N. Y., 1959).

Applied Psychology Research Unit, Cambridge (Gt. Brit.).
RESEARCH ON REVERSIBLE PERCEPTION OF SPEECH SOUNDS, by Richard M. Warren. Final rept. on Contract AF 61(052)184. 30 Sep 59, 26p. 3 refs. AFOSR-TR-59-148; AD-232 057.
Order from LC mi$2.70, ph$4.80 PB 146 098

The principal findings are: (1) Verbal transformations were obtained with all the repeating experimental stimuli, varying in complexity from 2 speech sounds to complete sentences. (2) Repeating speech made indistinct by masking noise produced fewer transitions and fewer different forms than the same recording heard clearly. (3) When loudness of speech was sufficient to insure clarity, further increase in loudness seemed to have little effect on verbal transformations. (4) Repeating unfamiliar words tended to be distorted in the first (and subsequent) forms into familiar words. (5) The combined data for all words show that the rate at which words were called out was the same for each minute of the 3 min. test period. (7) Previous stimulation by a word of closely related phonetic structure was followed (even after a few days) by responses related to the previous word. Other experimental findings are reported, and the phonetic and semantic characteristics of verbal transformations are discussed. A hypothesis is suggested which considers that verbal transformations result from the application of mechanisms underlying normal speech perception to the special conditions of repeating words.

Army Medical Research Lab., Fort Knox, Ky.
BIBLIOGRAPHY OF RESEARCH REPORTS IN PSYCHOPHYSIOLOGICAL STUDIES, 1955-1958, by Philip L. Sterling. 16 Mar 59, 17p. 143 refs. Rept. no. 359.
Order from LC mi$2.40, ph$3.30 PB 147 456

This report consolidates the research information provided under the support from the U. S. Army Medical Service from 1955 through July 1958. (Author)

California U., Los Angeles.
A FURTHER STUDY OF METHODS OF TRAINING FREE ASSOCIATION ORIGINALITY AND UNUSUAL USES, by Irving Maltzman, David Raskin, and Seymore Simon. Technical rept. no. 2 on Contract Nonr-233(50). Apr 59, 11p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 146 051

The purpose was to further explore possible relevant variables and alternative methods for facilitating originality. In the first experiment an attempt was made to determine whether two different methods of presenting uncommon associations to S_s would also facilitate the originality of their subsequent responses The second experiment is concerned with the effects of varying amounts of training, and was conducted as a result of some of the findings obtained in the first experiment.

Cognitive Operations Lab., Bethany Coll., [W. Va.]
CONCEPT IDENTIFICATION AS A FUNCTION OF NUMBER OF RELEVANT DIMENSIONS, by Wilbert S. Ray. Technical rept. no. 3 on Contract Nonr-2315(00). July 59, 19p. 13 refs. AD-220 051.
Order from LC mi$2.40, ph$3.30 PB 147 078

Several studies of concept formation have dealt with difficulty of acquisition as a function of the number of elements in the concept. Archer, Bourne and Brown (1955) find that difficulty increases with the number of irrelevant dimensions. Other experiments, such as those of Bruner, Goodnow and Austin (1956) and of Hovland and Weiss (1953), suggest that difficulty increases with the number of relevant dimensions, but none of these investigations has held constant the number of irrelevant dimensions. In the work reported here the number of irrelevant dimensions was held constant at zero.

Cognitive Operations Lab., Bethany Coll., [W. Va.]
ON THE INFLUENCE OF "CONGRUITY" ON THE SEARCH MECHANISM IN PROBLEM SOLVING, by Wilbert S. Ray. Technical rept. no. 2 on Contract Nonr-2315(00). July 59, 21p. 14 refs. AD-219 081.
Order from LC mi$2.70, ph$4.80 PB 147 080

The relationships which are the object of problem solving hold between 2 or more elements. Those elements which the problem solver considers first may be called congruous. Several conditions making for congruity are suggested, and 3 experiments investigating those conditions are described. The first experiment showed effects of cultural habits and of a bias produced by instructions, but failed to show any effect of visible similarity, or of familiarity with elements as occurring in pairs. The latter 2 variables appeared in a second experiment, but the first 2 disappeared. The third experiment attempted to make nonsense syllables similar by giving them similar meanings, and then transferred these syllables to an apparatus task to see whether the meanings would affect the order in which Ss used the switches of the apparatus. They did not do so. (Author)

Illinois U., Urbana.
INTERPERSONAL PRECEPTION AND INTERPERSONAL RELATIONSHIPS IN THERAPEUTIC COUNSELING, by J. McV. Hunt. Annual rept. no. 1 on Contract Nonr-1834(11). 15 Nov 57, 50p. 14 refs. AD-150 620.
Order from LC mi$3.30, ph$7.80 PB 137 981

The first section describes an analysis of the interpersonal preception scores obtained from the clients and counselors in the program of research on therapeutic counseling at the University of Illinois and an initial attempt to relate them to various measures of outcome in a test of their promise for use in further investigation. The second section describes the results of the factor analysis of the items of the Ewing Personal Rating Form. The third section is a working paper which outlines the results of this test of the independence of interpersonal perception scores of the content of descriptive items. It also presents a mathematical break-down of one of these scores, and tests the meaning of the components on a highly exploratory basis with two factors in 10 cases.

Institute for Research in Social Science, U. of North Carolina, Chapel Hill.
ANNUAL TECHNICAL REPORT. Rept. on Contract Nonr-855(04). Nov 57, 19p. 12 refs. AD-147 203.
Order from LC mi$2.40, ph$3.30 PB 146 046

Studies which are directed toward further understanding the determinants of various interpersonal behaviors are summarized.

Maryland U., College Park.
AN ASSOCIATIVE FACTOR IN THE CONSTRUCTION OF SENTENCES, by Charles N. Cofer. Technical rept. no. 25 on Learning, Retention and Recovery of Meaningful Material, Contract Nonr-595(04). July 59, 8p. 4 refs. AD-220 521.
Order from LC mi$1.80, ph$1.80 PB 147 071

Subjects were asked to choose one of two words to go with another word (A-word) in a sentence. It was hypothesized that choice would favor the one of the two words which was a higher associate, according to free association norms, of the A-word. The over-all results did not conform to this expectation. Analyses of items whose results did fit this expectation and of items which did not was carried out. Among the positive items, the high-frequency response to the A-word was also found (in the norms) to elicit the A-word as a frequent associate. In the negative instances, either both of the A-word associates or its less frequent associate elicited the A-word as an associate, according to the norms. Although the associative data are too scarce to permit a confident generalization, these findings suggest the significance of bidirectional associations in a choice situation of this kind. It was also pointed out that paradigmatic and syntamatic relations among the words are probably factors in choice. (Author)

Maryland U., College Park.
AN EXPLORATION OF CLUSTERING IN THE RECALL OF NOUNS EMBEDDED DURING PRESENTATION IN SENTENCES, by Charles N. Cofer and Erwin Segal. Technical rept. no. 27 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). July 59, 7p. 6 refs. AD-220 523.
Order from LC mi$1.80, ph$1.80 PB 147 074

A procedure is described for studying the effect of a sentence context on clustering in nouns. Twenty-four nouns were selected, 6 from each of 4 categories: occupations, articles of clothing, articles of furniture, and 4-footed animals. The six nouns for each category were selected from those which, according to the norms of Cohen, Bousfield, and Whitmarsh (Psychol. Rep. 4:39-44, 1958), were frequent associates to the category names. Six sentences were made up, all having very similar structures, and each sentence contained one noun from each of the 4 categories. The sentences were to the subjects of the experimental group. In order to provide control data for the recall of the nouns from the sentences, the 24 nouns were formed into 2 lists. In one the sequence of nouns was random, and in the other it was the same as it was in the sentences. An experiment was conducted to try this method. Findings indicated that recall of words is significantly impaired in the sentence condition at both immediate and delayed recalls. (See also AD-220 521, AD-220 522)

Maryland U., College Park.
CERTAIN MODIFIER EFFECTS WITH NOUNS VARYING IN DEGREE OF CLUSTERING TENDENCY by Charles N. Cofer and Erwin Segal. Technical rept. no. 29 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). July 59, 8p. 6 refs. AD-220 525.
Order from LC mi$1.80, ph$1.80 PB 147 072

Two experiments are described. The purpose of the first experiment was to determine whether inappropriate modification would affect the recall and clustering of strongly clustering nouns to an extent greater than it would effect these measures in weakly clustering nouns. The second experiment also examined the effects on strongly and weakly clustering nouns of a variable found in previous studies to reduce recall and clustering. This variable is the specificity with which adjectives modify their nouns. Results indicated that the specificity adjectives, like the inappropriate ones, tend to reduce clustering and recall in strongly clustering nouns, although the effects are not as great as expected. The weakly clustering nouns were affected less by the specificity effect than were the strongly clustering nouns. The effects of inappropriate modification were greatest in the strongly clustering words, which was contrary to expectations.

Maryland U., College Park.
INAPPROPRIATE MODIFICATION OF NOUNS IN A FACILITATION DESIGN, by C. N. Cofer and Erwin Segal. Technical rept. no. 28 on Learning, Retention and Recovery of Meaningful Materials, Contract Nonr-595(04). July 59, 6p. 6 refs. AD-220 524.
Order from LC mi$1.80, ph$1.80 PB 147 073

The present study investigates the possibility that the effects of inappropriate modification might be offset to some extent if inappropriate modification could be accomplished in the facilitation design.

Michigan U., Ann Arbor.
ATTITUDE CHANGE PROJECT. Annual rept. for 15 Nov 57-31 Jan 58 on Contract Nonr-1224(10). 1 Feb 58, 6p.
Order from LC mi$1.80, ph$1.80 PB 137 804

A theory on the relation of structure to perception has been sketched; experimental studies of opposites structure have been continued; and an investigation of attitude change and the generalization of that change within a structure based on associative linkages has been carried out.

[Northwestern U., Evanston, Ill.]
FACTORS INFLUENCING THE LEARNING AND RETENTION OF VERBAL MATERIALS, by Benton J. Underwood. Final rept. on Contract N7onr-450(08). 6 July 59, 3p. 26 refs.
Order from LC mi$1.80, ph$1.80 PB 147 081

The results of studies dealing with the effect of intertrial interval and interacting variables have been published as a series in the Journal of Experimental Psychology. Work on distributed practice led to problems not directly associated with the role of distribution. Publications are listed which represent efforts on these problems.

Psychological Research Associates, Arlington, Va.
PREDICTION OF ADVANCED LEVELS OF PROFICIENCY IN A COMPLEX TRACKING TASK, by James F. Parker, Jr. and Edwin A. Fleishman (Yale U.). Rept. on Human Factors in the Design of Training Equipment, Contract AF 41(657)64. Dec 59, 63p. 23 refs. WADC Technical rept. 59-255.
Order from OTS $1.75 PB 161 734

Two hundred three Air Force ROTC subjects were administered a large battery of printed and apparatus psychomotor reference tests from which 50 scores were taken. Following administration of the reference tests, subjects devoted 17 sessions distributed over a six-week period to practice on a complex tracking task. The matrix of intercorrelations among these scores was factor analyzed and 15 ability factors identified. An analysis then was conducted of the extent to which variation in performance in tracking at the different stages of practice could be accounted for in terms of the identified ability factors. The ability factors accounted for in terms of the identified ability factors. The ability factors accounted for only a small portion of the variance in tracking performance. Hypotheses are offered concerning the selection of a different set of reference measures which might be more effective. The analyses of these data do indicate, however, that the prediction of terminal tracking proficiency is better accomplished through a set of external measures than through initial scores taken directly from the tracking task. Early proficiency on the task itself was unrelated to terminal proficiency. (Author)

Research Center for Human Relations, New York U., N. Y.
GROUP EFFECTS ON TENSION PATTERNS AND MOTIVATION, by Murray Horwitz. Technical rept. no. 1 on Contract Nonr-285(28). Apr 59, 18p. 2 refs. AD-218 364.
Order from LC mi$2.40, ph$3.30 PB 146 049

The experiment described here is designed (a) to engage S in unpleasant tasks, (b) to induce social pressures upon S to deny his aversive feelings, (c) to examine effects upon muscle tensions. The results are reported in two parts: (a) evidence as to how well the experimental manipulations "took"; (b) effects on tensional activity.

Rutgers State U., New Brunswick, N. J.
HOMEOSTASIS THEORY OF SMALL GROUPS, by F. K. Berrien and William H. Angoff. Technical rept. on Contract Nonr-404(10). Dec 57, 26p. 1 ref.
Order from LC mi$2.70, ph$4.80 PB 137 996

The purpose of this research program is to test the usefulness of the concepts of homeostasis and equilibrium as they may be applied to small group phenomena. A detailed statement of the theory and pertinent literature bearing upon it is summarized. (See also PB 142 092)

Washington U., Seattle.
THE PREDICTION OF COLLEGE SUCCESS FROM BIOGRAPHICAL DATA AND SELF-RATINGS, by Wolf-Ulrich J. Hebenstreit. Rept. on Contract Nonr-477(08) and Public Health Research Grant M-743(C3) July 59, 40p. 16 refs. AD-220 239.
Order from LC mi$3.00, ph$6.30 PB 147 098

An attempt was made to determine whether items from the Personality Data Inventory (PDI) would correlate with the obtained Grade Point Average (GPA), and to determine the effect on scale validity of adding items of progressively decreasing item validity. Results indicated that 10 of the 33 items selected by the judges as probably predictive of GPA were found to be significantly correlated with GPA. The addition of less valid items did not have the expected effect; i.e., there was no evidence that the original validity coefficients has been spuriously high because of capitalizing on chance differences in the original sample.

Washington U., Seattle.
PRELIMINARY STEPS IN THE CONSTRUCTION OF FACTOR SCALES FOR THE MMPI, by Hayden LeRoy Mees. Rept. on Contracts Nonr-477(08) and Public Health Research Grant M-743(C3). July 59, 120p. 19 refs. AD-219 936.
Order from LC mi$6.00, ph$18.30 PB 147 090

A study is presented of the problems considered preliminary to the construction of factor scales for the Minnesota Multiphasic Personality Inventory (MMPI). These problems are: (1) finding the dimensionality of a selected set of MMPI items, (2) determining the degree to which these dimensions are similar when the items are used with 2 different populations of subjects, and (3) investigating the relationship between the items

and the dimensions. The results are cited as evidence for the relative invariance and psychological meaningfulness of these 3 factors: (1) a general complaint factor described in terms of serious psychopathology and denoting socially undesirable characteristics, (2) a regressive factor which measures denial of aggressiveness, and (3) factors related to feminine interest patterns. The similarity to results of factor analyses affirms the usefulness and adequacy of the methods used. The approach also provides information about the MMPI items which are directly applicable to the construction of the factor scales.

Willow Run Labs., U. of Michigan, Ann Arbor.
A STUDY OF DECISION MAKING UNDER RISK, by C. H. Coombs and D. G. Pruitt. Rept. on Project Michigan, Contract DA 36-039-sc-78801. Apr 60, 31p. 12 refs. 2900-33-T.
Order from LC mi$3.00, ph$6.30 PB 147 001

The importance of the human being in man-machine systems has made it necessary to study man as he functions in these systems, particularly to determine whether individuals possess any characteristic attitudes that would influence their decisions in risky situations. The present experiment has produced a theory which revises the theory of maximization of expected utility--i.e., that someone faced with alternative gambles will make the choice yielding the maximum average payoff. The revision of this theory suggests that, while he will always prefer more expectation (other things being equal), an individual may have a utility for risk which will exhibit itself as a preference for certain amounts of variance and skewness. The results of this experiment show that for the best results the desirable risk-taking characteristics of an individual should be known and squared with the system in which he operates. If a computer is designed to replace an individual in a decision-making role, the desired risk-taking characteristics must be built into its decision-making component. (Author)

BIOLOGICAL SCIENCES

Army Chemical Corps, Fort Detrick, Md.
USE OF ULTRAVIOLET RADIATION IN MICROBIOLOGICAL LABORATORIES, by G. Briggs Phillips and Everett Hanel, Jr. Nov 59, 391p. 328 refs.
Order from LC mi$11.10, ph$60.60 PB 147 043

The investigational program which is reported here was established because it was desirable first to survey the literature concerning the action and use of UV radiation, and second, to determine experimentally the susceptibility of various types of microorganisms when exposed to radiation under conditions that might be found in the infectious disease laboratory. Finally it was planned to use the assembled data as a guide in developing, designing and testing suitable UV installations for use in the infectious disease laboratory. Germicidal UV radiation is used in industry for protection of personnel and protection of the product. Its uses in this report have been directed primarily toward protection of personnel and test animals.

Public Health Service, Washington, D. C.
RADIOLOGICAL HEALTH DATA. Monthly rept. May 60, 46p. 40 refs. Vol. 1, no. 2.
Order from OTS $0.50, $3.00/6 mos. PB 161 371

Contents:
Sect. 1. Milk
Sect. 2. Air
Sect. 3. Water
Sect. 4. Other data
Sect. 5. Abstracts
(See also PB 161 371-1)

Anatomy and Physiology

Air Reduction Co., Inc., Murray Hill, N. J.
CLOSED CIRCUIT RESPIRATION/VENTILATION SYSTEM: PHASE I. Rept. on Contract AF 33(616)3856. Jan 60, 111p. 61 refs. WADD Technical rept. 60-33.
Order from OTS $2.50 PB 161 747

A literature survey was conducted to determine the physiological requirements of a man supported in an artificial atmosphere. Concurrently, a study was made of the environmental considerations which, combined with the physiological requirements, defined the desired characteristics of a closed circuit respiration/ventilation system. A closed circuit respiration/ventilation system was designed to support a man on a hypothetical twelve hour mission. The design, fabrication, and testing of each component are treated separately and limited results of tests of the assembled system are included. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
CHANGES IN TESTICULAR CHOLESTEROL IN THE SEMICRYPTORCHID AND SEMICASTRATE RAT, by Roger A. Hoffman, Mar 60, 11p. 7 refs. CWLR-2379.
Order from LC mi$2.40, ph$3.30 PB 147 331

Following unilateral cryptorchidism, cholesterol concentration and total amount in the testes undergo rapid changes. After 16 days the scrotal testis maintains normal levels while the abdominal testis shows a gradual decline. No difference was found in the scrotal testis and the remaining testis of the partially castrated rat, suggesting that these two conditions are comparable in so far as gonad cholesterol is concerned. The data suggest that rapid changes in FSH secretion occur following cryptorchidism and that the presence and functional integrity of the advanced germinal elements of the testicular tubules act to regulate pituitary gonadotrophin secretion. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
EFFECT OF 2-PAM ON RETENTION OF P^{32} OF LABELED VE OR VX IN BLOOD AND TISSUES OF THE CAT, by J. H. Wills, A. M. Kunkel and others. Dec 59, 15p. 5 refs. CWLR-2345; AD-231 236.
Order from LC mi$2.40, ph$3.30 PB 146 865

Geiger-Mueller counting of various tissues and urine from anesthetized cats injected intravenously with VE or VX labeled with P^{32} showed that liver, kidney, and lung are especially active in taking up the isotopic label. Administration of either atropine, 1-methyl-2-formylpyridinium iodide oxime (2-PAM), or a combination of atropine and 2-PAM had about the same effects on retention or urinary excretion of P^{32} given as VX. (Author)

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECT OF OXYGEN DEPRIVATION ON THE X-WAVE AND B-WAVE OF THE HUMAN ELECTRORETINOGRAM, by J. H. Hill. Rept. no. 13 on Task MR005.13-6002.1. 29 Mar 60, 77p. 40 refs. NADC-MA-6008.
Order from LC mi$4.50, ph$12.30 PB 146 899

The object of this investigation was to determine the effects of oxygen deprivation on the X-wave and the B-wave of the human electroretinogram. The electroretinograms were elicited by ten-second bursts of four-per-second flashes or three-second bursts of twenty-per second flashes of dark red, light red, green, or blue light at three levels of intensity. A burst of flashes was presented at one-minute intervals while the observer breathed air for 12 minutes, a nine per cent oxygen gas mixture for thirty minutes and then air again for twenty minutes. In all, electroretinograms were elicited and recorded in 18 such experimental sessions with two observers. Records obtained from the two observers showed that the amplitude of the X-waves elicited by dark red, light red, green, or blue light at four flashes per second and at twenty flashes per second was reduced when the observer breathed the oxygen-poor gas mixture. The reduction in X-wave amplitude was not found to vary with the spectral composition of the stimulus, but was found to be proportional to the amplitude of the waveform elicited in the initial air-breathing period. The amplitude of the B-wave elicited by the stimuli at four flashes per second was reduced to a lesser extent than the X-wave. When the losses in photopic and scotopic visual sensitivities were estimated from losses in amplitude of the X-wave and the B-wave respectively, the difference between the estimates was found to be insignificant. The relation of these finds to those of previous investigations is discussed. (Author)

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
THE EFFECTS OF MODERATE AND LOW LUMINANCES AND VARIOUS DURATIONS OF PRE-EXPOSURE ON DARK ADAPTATION, by Dorothy E. Fletcher. Rept. no. 3 on Project NM 001 110 300. 2 May 57, 36p. 10 refs. NADC-MA-5706; AD-134 621.
Order from LC mi$3.00, ph$6.30 PB 147 585

Monocular dark adaptation data for two observers were obtained with the Hecht-Shlaer adaptometer, fitted with a 2-mm diameter artificial pupil, as absolute thresholds taken by ascending series of the method of limits. After 30 minutes in the dark, the pre-exposure was presented at a luminance of from 0.000608 to 971 millilamberts (mL) and at a duration of from 0.01 to 20 minutes. The white+pre-exposure field was 35° in diameter, centered 10° nasally. The test field was green, 1° in diameter, 10° nasal in retinal location, and 0.02 second in duration. Single-limbed curves described data taken after pre-exposures of from -1.15 to 2.69 log mL-min for one observer and from -1.92 to 2.99 log mL-min for the other. As the product of pre-exposure luminance and duration increased over this range, the dark adaptation curves decreased in acceleration and increased in extent on the time axis and on the log threshold luminance axis. Similar but less extensive and less reliable effects were produced by increasing pre-exposure duration. (Author)

Aviation Medical Acceleration Laboratory, Naval Air Development Center, Johnsville, Pa.
PRELIMINARY STUDY OF DAMPING OF THE OTOLITH ORGAN SYSTEM BY EPICYCLIC ROTATION, by R. F. Gray and D. M. Morway. Rept. no. 10 on Task MR 005.13-6002-1, formerly NM 17 01 12.1. 28 Dec 59, 9p. TED ADC AE-1412; NADC-MA-5919; AD-231 600.
Order from LC mi$1.80, ph$1.80 PB 146 203

An attempt was made to determine the basic validity of the concept that the effects of gravity on the otolith organs can be eliminated by tumbling humans around a horizontal axis through the head. The method of testing this concept was to generate oculogravic illusions in subjects on the centrifuge by letting the direction of the resultant of centrifugal acceleration and gravity change in direction through the man so that his perceived vertical would change. Four subjects were tumbled in the plane of rotation of the centrifuge around a true vertical axis. Results indicated that tumbling does reduce the apparent tilt of the oculogravic illusion generated on a centrifuge. The rate of 30 rpm was not sufficiently high to completely eliminate these illusions. The few seconds at 30 rpm noted as being without oculogravic illusions suggested that a higher tumbling frequency may eliminate these illusions.

George Washington U. School of Medicine, Washington, D. C.
EFFECT OF LIPOTROPIC FACTORS ON COLD PHYSIOLOGY. III. KETONE BODY LEVELS IN THE COLD, by Carleton R. Treadwell. Rept. on Contract AF 18(600)463. Sep 57, 18p. 4 refs. Technical note AAL-TN-57-25; AD-230 835.
Order from LC mi$2.40, ph$3.30 PB 146 241

The effects of protein, fat, and carbohydrate contents of the diet on fat metabolism and especially on the development of ketosis in the cold, including the relation of age, sex, previous diet, and duration of exposure to cold, were investigated. Results indicated that cold is an effective lipotropic agent. No demonstrable requirements were found for lipotropic factors in the cold in rats receiving diets containing up to 40% fat. The principal effect of cold on the lipids of the liver, blood, adrenals, and kidneys was to produce a marked decrease (to normal levels) in the neutral fat fraction. Cold, over a 3-wk period, did not lower the

free or ester cholesterol content of the adrenals, indicating a later adjustment of the animals to the immediate stress of cold. Animals in the cold on high-fat diets can utilize large amounts of fat without a metabolic ketosis. In changing from a low-fat diet to a high-fat diet an immediate response of an increase in the blood lipid fractions was observed both at 25° and at 1°C. During the 3-wk period there is a gradual return to control levels at both temperatures. Animals at 1°C metabolize large amounts of fat without an increase in blood lipids over the levels of comparable animals at 25°C. The data on ketosis in the cold suggests that previous reports of metabolic ketosis were caused by an actual or relative deficiency of calories. (See also PB 146 243)

Medical Research Council (Gt. Brit.)
ADVANCED STUDIES ON THE CORRELATION OF ELECTRICAL RESPONSES OF THE CEREBRAL CORTEX, by R. Efron. Quarterly technical status rept. no. 3 for 1 Nov 59-31 Jan 60 on Contract DA 91-591-EUC-1139, OI-1421-59. Feb 60, 20p.
Order from LC mi$2.40, ph$3.30 PB 147 002

Contents:
Observations on the initially positive extracellularly recorded spike
Observations on the membrane potential of cortical units during induced seizures
Observations on single cortical units following application of strychnine and penicillin

Minnesota U., Minneapolis.
DEVELOPMENT OF A TECHNIQUE TO MEASURE CARBON DIOXIDE OUTPUT BY USE OF DOUBLY LABELED WATER, by Nathan Lifson. Final rept. for 1 Sep 54-31 Aug 57 on Contract Nonr-710(12). 9 Jan 58, 6p. 7 refs.
Order from LC mi$1.80, ph$1.80 PB 137 960

Naval Research Lab., Washington, D. C.
SOME METHODOLOGICAL CONSIDERATIONS IN MEASURING VISUAL THRESHOLDS FOR VELOCITY, by R. H. Brown. Interim rept. 21 Apr 60, 14p. 49 refs. NRL rept. 5477.
Order from LC mi$2.40, ph$3.30 PB 145 719

Theoretical analysis and review of literature data indicated the utility of three assumptions: first, that the distribution of responses reported in different experiments as a function of speed involved the effects of random variables; second, that the distribution function of speed in logarithmic units is normal, which assumption was supported by an analysis involving the Bunsen-Roscoe law of photochemistry and by plotting the frequency of velocity discriminations on log probability paper; and third, that the logarithmic-normal distribution function of speed provides for homogeneity of variance when an additional variable is introduced. The third assumption was supported by the conclusion from a review of a group of experiments involving different bivariate distributions of velocity discrimination as a function of field dimensions, luminance, speed during comparative judgments, and mode of observation that the standard deviation is proportioned to the mean of the distributions in speed. (Author)

North American Aviation, Inc., Los Angeles, Calif.
INSTRUMENTATION PACKAGE FOR INFLIGHT PHYSIOLOGICAL STUDIES, by M. N. Goldberg, R. A. Mills, and W. V. Blockley. Final rept. on Physiology of Flight, Contract AF 33(616)5866. Feb 60, 73p. WADD Technical rept. 60-83.
Order from OTS $2.00 PB 161 712

An instrumentation package has been developed for the monitoring of pilot physiological status during flights in the X-15. Data recorded include electrocardiograph signals, respiratory flow rates, skin and deep body temperatures, and helmet-suit and suit-cockpit pressure differentials. Environmental and flight tests were performed to determine the characteristics of the package and to survey subject response during stress. The package is capable of driving a pulse duration modulation (PDM) system for telemetering pressure data. Descriptions of the components and method of use are included. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
CHANGES IN FOOT VOLUME AND CAPILLARY FRAGILITY DURING CONTINUOUS COLD EXPOSURE AND STARVATION, by Paul S. Norman, Marlin B. Kreider, and P. F. Iampietro. Apr 60, 11p. 13 refs. Technical rept. EP-132.
Order from LC mi$2.40, ph$3.30 PB 146 905

The effects of continuous cold exposure (2 weeks at 60°F) and starvation on foot volume and capillary fragility were studied in 6 men. The experimental period was preceded and followed by 2-week periods (Control and Recovery) at 80°F and a caloric intake of 2,400 calories. Foot volumes decreased 6.1 percent in the first 5 hours of cold exposure and remained constant for the remainder of the experimental period. Foot volume was also measured after 3 minutes of elevation of the foot and occlusion of the blood supply. This volume decreased less during the experimental than the preceding or following periods. Capillary fragility decreased slowly during the experimental period and increased in the recovery period. On the third day of recovery, foot volumes were larger than at any other time. For the remainder of recovery, foot volume was the same as the control volume, but there was a greater decrease in volume with foot elevation. The results suggest that there was a constriction of all types of blood vessels during the experimental period, while in the recovery period there was apparently a simultaneous dilatation of large blood vessels and a constriction of small ones. One subject had a greatly increased volume of one foot, associated with pain and redness during early recovery days. These changes may be indicative of early trench foot or capillary damage. Starvation per se appeared to have no effect on foot volume. (Author)

Quartermaster Research and Engineering Center, Natick, Mass.
EFFECTS OF HIGH AND LOW HUMIDITY ON HEAT EXCHANGES OF LIGHTLY CLOTHED MEN, by P. F. Iampietro, E. R. Buskirk, and J. A. Vaughan. Apr 60. 10p. 4 refs. Technical rept. EP-131.
Order from LC mi$1.80, ph$1.80 PB 146 904

Six healthy young men were exposed, lightly clothed, to various combinations of wind (<1 and 10 mph), temperature (40 and 50°F) and relative humidity (30 and 100%). Skin and rectal temperatures and oxygen consumption were recorded. The results show that relative humidity had no effect on the physiological responses measured, whereas wind and dry bulb temperature had marked effects. This follows the pattern seen when men were exposed without clothing, and indicates that, under chamber conditions, there is little interaction between clothing and humidity that could account for cold-wet "chill". The importance of considering radiation in any comparison of cold-wet and cold-dry environments is discussed. (Author)

Systems Research Labs., Inc., Dayton, Ohio.
MODEL 16 AUTOMATIC BLOOD PRESSURE MEASURING INSTRUMENT, by Richard A. Johnson. Rept. on Physiology of Flight, Contract AF 33(616)5829. Dec 59, 51p. Research rept. 16-4F; WADC Technical rept. 59-429.
Order from OTS $1.50 PB 161 707

An Automatic Blood Pressure Measuring System for detecting and measuring the arterial diastolic and systolic pressures of a human has been developed. The purpose of this system is to provide physiological information about an individual while he is being subjected to varying conditions of environment and stress. The system is unique in that it uses transistor logic for performing the program functions. It is housed in a compact, portable case and is equipped with a carrying handle. The range of operation is from 100 to 200 mm. of mercury, and the measurement can be automatically repeated at intervals varying from 1 to 15 minutes. (Author)

Tufts [U.] Medford, Mass.
RELATIVE MERITS OF SLOW VERSUS RAPID REWARMING AND INTERNAL VERSUS EXTERNAL REWARMING FOLLOWING ACUTE GENERAL AND LOCAL HYPOTHERMIA. II, by Benjamin G. Covino and Henry E. D'Amato (Arctic Aeromedical Lab.). Rept. on Contract AF 41(657)183. Oct 58, 18p. 3 refs. Technical note AAL-TN-59-4.
Order from LC mi$2.40, ph$3.30 PB 147 286

Research was carried out to determine the physiological response of local body surfaces, e.g. limbs, to subzero air temperatures and to evaluate the relative merits of various rewarming techniques in ameliorating the effects of frostbite. Studies were also made to ascertain the cardiovascular changes which occur during the cooling and rewarming phases of general hypothermia and to evaluate the relative merits of various rewarming techniques. (See also PB 146 238)

Tufts U. School of Medicine, Boston, Mass.
THE EFFECT OF ADRENALECTOMY ON ALBUMIN-PALMITATE-1-C^{14} OXIDATION, by E. J. Masoro, M. D. Valentine, and J. M. Felts. Rept. on Contract AF 41(657)145 and Public Health Research Grant RG 4989. June 58, 11p. 17 refs. Technical note AAL-TN-58-6.
Order from LC mi$2.40, ph$3.30 PB 147 291

The oxidation of albumin-palmitate-1-C^{14} (NEFA) to $C^{14}O_2$ was studied in sham-operated and adrenalectomized rats fasted for 12-18 hours. The $C^{14}O_2$ yield was approximately the same in both animal groups. The conclusion is drawn that the ability of the rat tissues to oxidize long-chain fatty acids is not affected by adrenalectomy. It was found that the $C^{14}O_2$ production from the albumin-palmitate complex is not related either to the size of the animal or to the endogenous metabolism, as shown by the total CO_2 production. (Author)

University of Southern California, Los Angeles.
COMPARATIVE HISTOLOGICAL STUDIES OF THE DIGESTIVE TRACT OF WARM AND ACTIVE AND HIBERNATING ARCTIC GROUND SQUIRRELS, by Sol Bernick and William V. Mayer (Arctic Aeromedical Lab.). Rept. on Contract AF 18(600)843. Sep 58, 13p. 7 refs. Technical note AAL-TN-58-28.
Order from LC mi$2.40, ph$3.30 PB 147 287

As hibernation progresses there is a decrease in both number and activity of the parietal and chief cells of the stomach. During hibernation mitoses in the crypts of Lieberkühn of the small intestine are reduced and are not demonstrable after 3 weeks of hibernation. During this same period the staining property of the Paneth cells is likewise reduced. The colon exhibits a reduction in the mucous of the goblet cells during hibernation. All regions of the digestive tract investigated were essentially normal 24 hours after awakening from hibernation.

Biochemistry

Cincinnati General Hospital, Ohio.
ENZYME ACTIVITY IN HUMAN LIVER, by Leon Schiff and James F. O'Donnell. Rept. for 1 Mar 58-15 Feb 59 on Contract DA 49-007-MD-882. 20 Feb 59, 9p. 10 refs. AD-211 137.
Order from LC mi$1.80, ph$1.80 PB 146 010

Human liver tissue specimens have been obtained at surgery or in some instances at autopsy as soon after death as possible. The acid-soluble fractions of 16 of these liver specimens have been prepared and column chromatography carried out to analyze for the nucleotide components. It has been found that characteristically the triphosphorylated nucleotides are diminished in patients with hepatitis and cirrhosis and in some cases of carcinoma of the liver. Levels of the enzyme ATPase are also being determined on liver specimens and from the five cases studied to date there appears to be increased activity in patients with liver disease. These data fit well with the theory that in liver disease uncoupling of oxidative phosphorylation results in increased levels of ATPase and consequent lowering of the ATP content of liver. (Author)

George Washington U. School of Medicine, Washington, D. C.
EFFECT OF LIPOTROPIC FACTORS ON COLD PHYSIOLOGY. I. PRELIMINARY EXPERIMENTS, by Carleton R. Treadwell. Rept. on Contract AF 18(600)463. Sep 57, 19p. 6 refs. Technical note AAL-TN-57-23.
Order from LC mi$2.40, ph$3.30 PB 147 290

Johnson Research Foundation, U. of Pennsylvania, Philadelphia.
PROPERTIES OF ENZYMATIC SYSTEMS, A THEORETICAL AND EXPERIMENTAL STUDY, by Britton Chance. Annual rept. on Contract Nonr-551(15). [1959] 3p.
Order from LC mi$1.80, ph$1.80 PB 146 048

The purpose of this research program is to obtain precise mathematical formulation of mechanisms representing enzyme reactions and to compare these with the results of direct experiments on the same system. This report emphasizes the use of the digital computer.

School of Aviation Medicine, Brooks AFB, Tex.
EFFECTS OF CORTICOTROPIN ON EXCRETION RESPONSES OF RATS ACCLIMATED TO VARIOUS ENVIRONMENTS, by Henry B. Hale and Roy B. Mefferd, Jr. Aug 59, 27p. 18 refs. Rept. 59-81; AD-229 895.
Order from LC mi$2.70, ph$4.80 PB 146 148

The effects of corticotropin (ACTH) in low dosage on metabolic responses of male rats acclimated to cold, neutral, or hot environments or to low barometric pressure were determined. Determinations included urinary Na, K, Ca, P, Mg, urea, uric acid, creatinine; creatine, taurine, β-alanine, glycine, α-alanine, valine, methionine, serine, threonine, tyrosine, glutamic acid, aspartic acid, lysine, arginine, histidine, glucose, glucuronic acid, phenolic acids, and coproporphyrin. Fecal determinations were made for coproporphyrin, protoporphyrin, and deuteroporphyrin. The metabolic responses studied were those which occurred when the differently acclimated groups of rats were exposed to adverse conditions other than those to which they were acclimated. ACTH augmented certain responses and diminished others. There were some metabolic responses which which were unaffected by ACTH. Environmentally nonspecific effects were identified among these results, and a comparison was made between two strains of rats. (Author)

School of Aviation Medicine, Brooks, AFB, Tex.
INFLUENCE OF SODIUM CHLORIDE ON FAT FORMATION BY ESCHERICHIA COLI AND CERTAIN OTHER GRAM-NEGATIVE BACTERIA, by Walter Sellers, Roland B. Mitchell, and Harry M. Hughes. Jan 60, 5p. 6 refs. Rept. 60-24.
Order from LC mi$1.80, ph$1.80 PB 146 146

Under a variety of experimental conditions, formation of free fat by Esch. coli was increased by added NaCl. However, addition of NaCl was devoid of effect on fat formation by Ps. aeruginosa, and resulted in decreased fat formation by A. faecalis.

Tulane U., New Orleans, La.
STRUCTURE AND FUNCTION OF CHYLOMICRONS, by Roy H. Turner. Rept. for 1 Sep 50-28 Feb 59 on Contract DA 49-007-md-79. [1958] 23p. 6 refs. AD-212 296.
Order from LC mi$2.70, ph$4.80 PB 146 825

This report summarizes studies of serum lipids, with particular reference to several physiological and pathological influences which modify lipids in the ultracentrifugal fraction of minimum density, (FMD), with respect to its quantity and quality, as described by statistical methods. The results of the studies reported support the hypothesis that large concentrations of triglyceride in postabsorptive serum of humans may reflect one of the metabolic peculiarities which predispose individuals to development of atherosclerosis, and that the predisposition is greater when the fat is carried by beta lipoprotein then when carried by alpha,

General Biology

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
THE ELECTRICAL CONDUCTANCE AND DIELECTRIC CONSTANT OF THE INTERIOR OF ERYTHROCYTES, by H. Pauly and H. P. Schwan. Technical rept. no. 28 on Contract Nonr-551(05). [1958] 84p. 56 refs. AD-219 122.
Order from LC mi$4.80, ph$13.80 PB 147 059

The impedance of erythrocytes of man, beef, sheep, dog, cat, rabbit, and chicken was measured in the range from 0.5 to 250 Mc. The electrical conductance of the interior of the red blood cells was measured between 70 and 100 Mc. The values differ from species to species within the rather limited range from 4.4 to 5.3 mMho/cm. The theoretical value, calculated on the basis of the salt content of the cell, its ion mobility and the volume concentration of hemoglobin, is roughly twice as large as the measured value. As yet there is no quantitative explanation for this discrepancy. This discrepancy is not a typical property of the living red blood cell. After removal of the cell interior into a highly concentrated hemoglobin solution, the conductivity is practically unchanged. This leads to the conclusion that the cell interior behaves -- from an electrical point of view -- like a highly concentrated hemoglobin solution. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
THE ELECTRICAL PROPERTIES OF THE MITOCHONDRIAL MEMBRANE, by Helmut Pauly, Lester Packer, and H. P. Schwan. Technical rept. no. 29 on Contract Nonr-551(05) and Public Health Service USPH-1253(C6). [1959] 43p. 31 refs.
Order from LC mi$3.30, ph$7.80 PB 147 060

The electrical capacity of the membrane of rat liver mitochondria is 0.5 to 0.6 μ farad/cm^2. This membrane capacity is obtained from the analysis of the frequency dependence of the admittance of a suspension of swollen mitochondria. In potassium chloride media the mitochondrial membrane capacity does not depend on the ion concentration. The internal conductance of the mitochondria was approximately two times lower than that of the external medium; the same applies if the mitochondria are equilibrated in a medium with a 10-fold difference in potassium chloride concentration. Hence the swollen mitochondria investigated here appear to be able to adjust their internal ion concentration in proportion with that of the external phase. The similarity of the membrane capacity of isolated mitochondria with the range of values

known for other membranes suggests a common molecular structure. The analysis of experimental data suggests an unisotropic electrical behavior of the interior of mitochondria. This unisotropy is readily explained by the existence of internal membranes. (Author)

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
THE RELATIONSHIP OF INTERNAL CONDUCTANCE AND MEMBRANE CAPACITY TO MITOCHONDRIAL VOLUME, by Helmut Pauly and Lester Packer. Technical rept. no. 30 on Contracts Nonr-551(05) and USPH-1253(C6). [1959] 37p. 31 refs.
Order from LC mi$3.00, ph$6.30 PB 147 061

A study was made of the effect of mitochondrial size on the electrical properties of the membrane and the internal conductivity of mitochondria. The dielectric constant and electrical conductivity of suspensions of guinea pig heart mitochondria were examined in the frequency range 5×10^5 to 2.5×10^8 cps. Membrane capacity was calculated to be 1.1 - 1.3 μ Farad/cm^2 and was virtually the same in mitochondria whose surface area was made to vary by a factor of 4 by osmotic means. This finding suggested that some mechanism must exist for the transfer of mitochondrial material into membrane structure during fluctuations in mitochondrial size. The electrical capacity of the membrane was unaffected by a 33-fold change in potassium chloride concentration. The internal conductance of swollen mitochondria was 2-3 times lower than that of the external medium. In contracted mitochondria the internal conductance was virtually independent of the conductivity of the external medium. These results were discussed in relation to current concepts of mitochondrial structure. (Author)

Medical Specialties and Equipment

Army Prosthetics Research Lab., Washington, D. C.
POROUS METAL MOLDS. PART I, by M. J. Fletcher and Fred Whisenhunt. 26 Mar 58, 9p. Technical rept. 5807; AD-160 649.
Order from LC mi$1.80, ph$1.80 PB 145 965

In line with current efforts to obtain a durable, efficient, porous mold for casting latex films, the first attempt has been made to produce a porous metal mold. In general, porous metals have been attained by three means: Powder metallurgy, leaching and plating. This first study has been conducted with brass plating for the leaching operation.

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
DESIGN AND CONSTRUCTION OF PHYSIOLOGICAL ELECTRONIC SYSTEMS USING OPERATIONAL AMPLIFIERS, by Freeman W. Cope. Rept. no. 9 on Task MR005.15-0002.7. 7 Apr 60, 9p. 4 refs. Proj. TED ADC AE RS-7045; NADC-MA-6010.
Order from LC mi$1.80, ph$1.80 PB 146 898

The use of operational amplifiers allows the construction of a great variety of physiological electronic systems at minimum cost and with a minimum knowledge of electronics design and with minimum expenditure of time. An operational amplifier in conjunction with 2 or 3 external plug-in resistors or capacitances may be used as a D. C. amplifier, an integrator, or a differentiator. Many more complicated physiological electronics systems may be designed and constructed with comparable ease and at modest cost using operational amplifiers. (Author)

Pathology

Army Chemical Warfare Labs., Army Chemical Center, Md.
STUDIES IN WOUND BALLISTICS: TEMPORARY CAVITIES AND PERMANENT TRACTS PRODUCED BY HIGH-VELOCITY PROJECTILES IN GELATIN, by Mas Krauss and John F. Miller. Feb 60, 30p. 11 refs. CWLR-2340; AD-233 840
Order from LC mi$2.70, ph$4.80 PB 146 863

In the present experiments, caliber .30 and caliber .22 bullets, caliber .30 fragment simulators, and 1/4-in. steel spheres were fired into cylinders of 20% gelatin, some of which were confined in rigid plasticized fiberglass casings. A simple method for approximating the cross-sectional dimensions of the temporary cavity from the cross-sectional dimensions of the permanent missile path in 20% gelatin is described. Experiments with confined gelatin cylinders showed that the temporary cavity can be almost completely suppressed by external constraint of the gelatin. It was shown that energy absorption and momentum transfer in 20% gelatin are independent of temporary-cavity formation. Implications of these findings are discussed. (Author)

University of Southern California, Los Angeles,
THE EFFECTS OF STAGNANT ANOXIA ON THE CAPILLARY CIRCULATION, by Chester Hyman, Sheldon Rosenfeld and others. Rept. on Contract W33-038-ac-19062. Oct 49, 32p. 9 refs. AF Technical rept. no. 5974; ATI-69 292.
Order from LC mi$3.00, ph$6.30 PB 147 385

Based on the present studies, as well as a review of the literature, there is reason to believe that the blood vessels in mammalian muscle and skin are capable of enduring periods of stagnant anoxia in excess of one hour with minimal residual damage. The present studies call attention to the transient alteration in normal fluid equilibrium which occurs during the period of reactive hyperemia, and which results in a limited amount of edema formation. (Author)

Pharmacology and Toxicology

Army Chemical Warfare Labs., Army Chemical Center, Md.
AEROSOL IMPACTION ON SMALL DIAMETER COLLECTORS, by Donald O. Egner and Donald Campbell. Feb 60, 23p. 4 refs. CWLR-2352.
Order from LC mi$2.70, ph$4.80 PB 146 867

Information is reported pertaining to the collection efficiency of given size droplets on ribbon-like and cylindrical sampling devices having diameters of 1/10 to 1 inch. Methods of determining droplet-size distributions and wind velocities by mass measurements are also discussed. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
EFFECT OF ENVIRONMENTAL TEMPERATURE ON TOXICITY OF GB INTRAVENOUSLY ADMINISTERED, by Harry M. Frankel and William V. Blevins. Jan 60, 9p. 5 refs. CWLR-2348; AD-231 374.
Order from LC mi$1.80, ph$1.80 PB 146 866

Relative lethality of intravenously injected GB at high and low environmental temperatures was compared to room temperature. Results indicated that (1) acute exposure of rats at 4°C decreases the LD50 dose of injected GB; (2) acclimation of rats at 4°C increases the LD50 dose of injected GB; (3) exposure of the rat to 4°C only after injection of GB is more deleterious than exposure only before injection; and (4) neither acute exposure nor acclimation to 34°C alters the LD50 dose for GB from that determined at room temperature. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE RELATIONSHIP OF THE LD50 AND RBC-ChE50 IN GUINEA PIGS EXPOSED TO GB BY THE INHALATION AND INTRAVENOUS ROUTES, by William S. Koon, James W. Crook and other. Feb 60, 27p. 11 refs. CWLR-2342.
Order from LC mi$2.70, ph$4.80 PB 146 864

GB was administered to guinea pigs to determine the inhalation and intravenous LD50 and RBC-ChE50 values. The LD50 value is approximately three times the RBC-ChE50 value for both the inhalation and intravenous routes of administration. The inhalation LD50 and RBC-ChE50 values are approximately twice as large as the corresponding intravenous values. (Author)

Southern Research Inst., Birmingham, Ala.
EVALUATION OF SOME DECONTAMINATION PROCEDURES, by C. E. Feazel. Rept. no. 5 (Final) for 29 Jan 56-28 Feb 57 to Army [Chemical] Warfare Labs. 28 Feb 57, 5p. 4 refs. Rept. no. 3048-740-V; AD-124 736.
Order from LC mi$1.80, ph$1.80 PB 138 234

This final report briefly summarizes the work done during the period January 29, 1956, through February 28, 1957.

Wisconsin U. [Madison.]
ROLE OF SOLVENTS IN PENETRATION OF SKIN BY CHEMICAL AGENTS. I. METHOD OF COLLECTION AND CHARACTERIZATION OF HUMAN SKIN LIPIDS, by James E. Tingstad, Dale E. Wurster, and Takeru Higuchi. Rept. on Contract DA 18-108-CML-5753. [1956] 67p. 63 refs. CWL Technical Memo. 27-8.
Order from LC mi$3.90, ph$10.80 PB 146 830

A procedure has been developed to collect and characterize skin lipids on a substantial scale. Chemical data obtained on the material collected indicate that the nature of the lipids was relatively insensitive to the exact collection method but appeared to vary markedly from donor to donor and quite significantly with season. Evidence is presented which indicate that the collected material actually represent the products of the sebaceous glands and may constitute the major barrier towards skin penetration. A countercurrent distribution study has led to isolation of crystalline components which are at least in part responsible for the observed variation. (Author)

Wisconsin U. School of Pharmacy, Madison.
FINAL REPORT, by Louis W. Busse. Rept. for 24 May 55-30 June 58 on Contract DA 18-108-cml-5753; continuation of Contract DA 18-108-cml-2576. [1958] 264p. 108 refs. AD-235 602.
Order from LC mi$11.10, ph$41.10 PB 146 756

Contents:
Permeation of mechanical barriers by chemical agents (MLCR-32)
Permeation of mechanical barriers by true diffusion (MLCR-56)
Adsorption characteristics of GB from solution (MLCR-58)
The influence of active fillers on the permeability of semi-solids (CWLR-2009)
Theories and relationships dealing with diffusional movement of chemical agents
A new relationship for the dielectric properties of two-phase mixtures (Pub. in Jnl. of Physical Chemistry 62:649-653, 1958)
The thermodynamic activity of sarin in solution (CWL SP-2-16, PB 142 248)
A thermometric method for thermodynamic studies and molecular weight determination in solutions

CHEMISTRY

Analytical Chemistry

Rock Island Arsenal Lab., Ill.
COMPOSITION OF ZINC PHOSPHATE COATINGS, by Jodie Doss. 28 Oct 57, 21p. 9 refs. Rept. no. 57-2612.
Order from LC mi$2.70, ph$4.80 PB 147 432

Determinations were made for phosphate (PO_4), zinc (Zn) and iron (Fe) in zinc phosphate coatings formed in four different solutions after various processing times. The percent of phosphate (PO_4), zinc (Zn) and iron (Fe), found in zinc phosphate coatings remains approximately the same regardless of the processing time, the accelerator used, or the operating condition of the phosphating solution. The coatings were found to contain approximately 40.8 percent phosphate (PO_4), 12.3 percent iron (Fe), and 32.3 percent zinc (Zn). The sum of the above percentages was found to be approximately 85.4 percent. The remaining 14.6 percent of the coating was presumed to be water. (Author)

Tennessee U., Knoxville.
FLAME PHOTOMETRIC STUDY OF BORON [AND] FLAME PHOTOMETRIC DETERMINATION OF ELEMENTS ASSOCIATED WITH BORON IN BORON CONTAINING COMPOUNDS. PART I: COPPER, by John A. Dean, Morton Salkind, and Clarice Thompson. Final proj. rept. on Subcontract [NOa(s) 52-1023]. June 54, 53p. 16 refs. MCC-1023-TR-59.
Order from LC mi$3.60, ph$9.30 PB 147 017

This investigation describes the application of the flame photometer to the rapid, routine determination of boron. The method should be of particular interest to those laboratories that are concerned with borohydrides and other boron containing compounds. The flame photometric procedure offers a rapid instrumental means of determining boron compared to conventional distillation methods and is particularly applicable to the processing of a large number of samples. Determinations of boron by means of the green flame coloration are discussed by Stahl and applied to agricultural materials by McHargue, McHargue and Calfee, Calfee and McHargue, and Weber and Jacobson. These workers used either visual methods or photographic recording in conjunction with a spectrograph.

Inorganic Chemistry

Office of Technical Services, Dept. of Commerce, Washington, D. C.
RARE EARTH ELEMENTS (1940-1960). Mar 60, 20p. 533 refs. OTS Selective Bibliography 404.
Order from OTS $0.10 OTS SB-404

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. Reports listed include research on light and heavy rare earth elements, their metals, alloys, and compounds, as well as the hazards involved in handling.

Massachusetts Inst. of Tech., Cambridge.
HYDROGEN PEROXIDE LABORATORIES, by W. C. Schumb and C. N. Satterfield. Quarterly periodic status rept. on Contract Nonr-1841(11). 31 Mar 59, 25p. AD-214 607.
Order from LC mi$2.70, ph$4.80 PB 146 034

Covers the following:
Stability studies
Heterogeneous catalysis in liquid hydrogen peroxide
Burning velocities of the H_2O_2 decomposition flame at low pressures
Stability of hydrogen peroxide to radiation
Hydrogen peroxide from the partial oxidation of propane in a porous-walled reactor
(See also PB 143 934)

Organic Chemistry

Aerojet-General Corp., Azusa, Calif.
CHAIN-TRANSFER OF NITRO COMPOUNDS IN POLYMERIZATION REACTIONS, by T. R. Fukuto and J. P. Kispersky. Rept. on Contract N7onr-462, T.O. 1. 25 May 53, declassified 20 Apr 60, 38p. 47 refs. Rept. no. 700 (Special).
Order from LC mi$3.00, ph$6.30 PB 147 271

The chain transfer constants for 12 aliphatic nitro compounds and a nitrate ester with methyl methacrylate were found to vary from $< 10^{-4}$ to 1. Several possible mechanisms for the transfer reaction are discussed. The inhibition of methyl methacrylate polymerization is reported. The reason for the inhibition is believed to be the formation of NO_2. Attempts to determine the chain-transfer constants of the nitro compounds with styrene and vinyl acetate were unsuccessful. The polymerization of 2,2,2-trinitroethyl methacrylate using various initiator concentrations gave a polymer with a constant molecular weight, corresponding to a $\overline{P_n}$ of about 12.

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
EFFECT OF CIS-TRANS ISOMERISM ON THE UREA INCLUSION COMPOUND FORMING-ABILITY OF A MOLECULE: A STUDY OF THE MALEATE-FUMARATE SYSTEM, by Jack Radell, Joseph W. Connolly, and William R. Cosgrove, Jr. Feb 60, 13p. 9 refs. WADC Technical note 59-407.
Order from OTS $0.50 PB 161 730

Several maleates and fumarates were investigated to determine their ability to form urea inclusion compounds. Olefinic esters of both acids will form inclusion compounds. However, the shortest chain required to stabilize a particular ester was related to the over-all cross-sectional diameter of the ester. The fumarates, having the more slender conformation form complexes more readily than the maleates. (Author)

Brussells Free U. (Belgium).
THE MECHANISM OF THE PHOTOCHLORINATION OF SIMPLE CHLORINATED HYDROCARBONS, by S. Dusoleil, P. Goldfinger and others. Final technical rept. on Contract DA 91-591-EUC-994. Dec 59, 78p. 36 refs.
Order from LC mi$4.50, ph$12.30 PB 147 435

The number of parameters measured in the reaction system Cl_2, C_2Cl_4, C_2HCl_5 leading to a unique set of elementary rate constants seems to settle definitely the mechanism of this reaction between room temperature and 500°K. It leads to a general outlook on the mechanism of the photochlorination of more or less chlorinated simple hydrocarbons. (Author)

Carbon Research Lab., U. of Buffalo, N. Y.
INVESTIGATION OF ELASTIC AND THERMAL PROPERTIES OF CARBON-BASE BODIES, by S. Mrozowski, J. F. Andrew and others. Rept. for May 58-June 59 on Ceramic and Cermet Materials, Contract AF 33(616)5186. Mar 60, 93p. 21 refs. WADC Technical rept. 58-360, Pt. 2.
Order from OTS $2.25 PB 161 733

In continuation of the work four basic types of carbon were prepared from (1) soft filler and soft binder, (2) soft filler and hard binder, (3) hard filler and soft

binder, (4) hard filler and hard binder. Elastic moduli, permanent set, shrinkage and density; electric resistivity and thermal expansion coefficient were investigated in dependence on heat treatment temperature and also the variation of the heat conductivity and electrical resistivity on ambient temperature in the range 1200-3000°C. An apparatus for direct determination of the heat diffusivity in the temperature range 100-700°C was set up and reasonably good data for the diffusivity coefficient obtained. Studies of ultra-attenuation show that the decay in intensity of transmitted waves is due to: (1) energy losses due to hysteresis effect present for all wavelengths, (2) scatter of waves by pores, observable only when the wavelength becomes shorter than 10 particle diameters. A discussion of the merits of various types of carbons closes the report. (Author)

Cornell U., Ithaca, N. Y.
NONIONIC DETERGENTS IN NONAQUEOUS SOLVENTS 1: THE BEHAVIOR OF α-MONOGLYCERIDES (Cont'd), by P. Debye and H. Coll. Technical rept. no. 2 on Contract Nonr-401(17). 15 May 59, 45p. 28 refs.
Order from LC mi$3.30, ph$7.80 PB 146 513

The behavior of α-monoglycerides (α-monoesters of glycerin and fatty acids with chains from 10 to 18 carbon atoms) has previously been studied in this laboratory, and the results have been communicated. These results formed the basis for the present investigation. Most important was the conclusion that light scattering showed the formation of clusters containing 20 to 70 monomers of monoglycerides in benzene, and that hydrogen bonds are effective in this association. In the presence of certain impurities, other than water, the clusters appeared to expand, as evidenced by higher intensities of scattered light. Likewise, the clusters appeared to be smaller in chlorobenzene, and also smaller in the case of esters with longer fatty acid chains.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
INVESTIGATION OF SYNTHETIC METHODS FOR PREPARING THE FLUORO DERIVATIVES OF SYMMETRICAL TRINITROBENZENE, by Victor L. Siele and Harold J. Matsuguma. Apr 60, 20p. 19 refs. Technical rept. 2682.
Order from LC mi$2.40, ph$3.30 PB 145 510

Three synthetic reaction schemes leading toward the preparation of fluoro-2, 4, 6-trinitrobenzene, 1, 3-difluoro-2, 4, 6-trinitrobenzene, and 1, 3, 5-trifluoro-2, 4, 6-trinitrobenzene have been investigated. The methods employed involved: (a) the nitration of fluorobenzene, 1, 3-difluorobenzene, and 1, 3, 5-trifluorobenzene; (b) the replacement of chlorine in chloro-2, 4, 6-trinitrobenzene, 1, 3-dichloro-2, 4, 6-trinitrobenzene, and 1, 3, 5-trichloro-2, 4, 6-trinitrobenzene with fluorine by indirect fluorination; and (c) the replacement of the hydroxyl groups in picric acid, styphnic acid, and trinitrophloroglucinol with fluorine, using phosphoryl fluoride as the fluorinating agent. Attempts to prepare these compounds have been unsuccessful. It has been shown conclusively that the fluoro derivatives of trinitrobenzene cannot be prepared by the nitration or phosphoryl fluoride approaches. The halogen exchange method deserves further consideration, since in a few isolated experiments exchange was apparent. A more active potassium fluoride, namely potassium fluorosulfinate, will be investigated as a possible exchange reagent. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
SINGLE-POINT DETERMINATION OF INTRINSIC VISCOSITY, by Marie C. Ormiston, Richard J. Valles, and David W. Levi. May 60, 14p. 11 refs. Technical rept. 2687.
Order from LC mi$3.30, ph$7.80 PB 146 400

Intrinsic viscosities of stereoregular polybutene-1 fractions were determined in decalin at 115°C. Use of the Hart rearrangement of the Schulz-Blaschke equation at specific viscosities below 1 made it possible to calculate intrinsic viscosities from single-point determinations after estimation of N in the equation from complete intrinsic viscosity data on three or more fractions. The single-point procedure for low specific viscosities was applied to data previously obtained for a series of alkyl methacrylate polymers in good and in poor solvents. In every case the agreement between experimental and calculated values was found to be reasonably good, generally falling within the range of the experimental error. At higher specific viscosities N appeared to depend on η_{sp} as observed by Hart, although the data was somewhat limited. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
THERMOANALYTICAL CHARACTERIZATION OF SEVERAL QUINOL CLATHRATE COMPOUNDS, by Martin Gilford and Saul Gordon. Mar 60, 27p. 13 refs. Technical notes no. 41.
Order from LC mi$2.70, ph$4.80 PB 145 517

Quinol host clathrates of sulfur dioxide, carbon dioxide, and methanol have been prepared following methods appearing in the literature. The stoichiometry of the prepared complexes has been established. The techniques of differential thermal analysis (DTA) and thermogravimetry (TGA), under ambient and reduced pressures, have been applied in a study of their thermally induced decomposition. Endothermal behavior has been found to attend the breakdown of the clathrate complex with escape of the included guest species. This decomposition occurs at temperatures 10 to 86 degrees below the melting point of the quinol host, which is 173.5°C. The pressure dependency of this breakdown has been established by both DTA and TGA techniques. Application of hot-stage microscopy has given evidence of the temperature range over which decomposition occurs. (Author)

Massachusetts U., Amherst.
O-ACYLHYDROXYLAMINES. I. SYNTHESIS OF O-BENZOYLHYDROXYLAMINE, by Louis A. Carpino, Chester A. Giza, and Barbara A. Pepe. Rept. on Contract AF 18(603)114. 16 Sep 58, 14p. 15 refs. AFOSR-TN-58-759; AD-201 857.
Order from LC mi$2.40, ph$3.30 PB 137 691

O-Benzoylhydroxylamine has been synthesized by taking advantage of the ease of cleavage of the carbo-t-butoxy group. The hydrochloride was obtained analytically pure whereas the free base was found to be an unstable oil which suffered O- to N rearrangement of the benzoyl group. (Author)

Shell Development Co., Emeryville, Calif.
POTENTIAL CW AGENTS. TASK 3. ANALOGS OF TETRAHYDROCANNABINOL, by D. E. Winkler and R. R. Whetstone. Final rept. on Contract [DA 18-108-]cml-4564. 30 Apr 54, declassified 5 Feb 58, 11p. 5 refs. S-13589; AD-201 570.
Order from LC mi$2.40, ph$3.30 PB 147 365

Analogs of tetrahydrocannabinol in which the 3-alkyl group, the 5-oxygen or the 1-hydroxyl were varied were prepared for evaluation as psychochemical agents. Of particular interest chemically was the extension of the synthesis of such compounds by reaction of pulegone with a m-difunctional benzene to the sulfur and nitrogen heterocyclics. (Author)

Technical U., Trondheim (Norway).
THEORETICAL INVESTIGATIONS USING ELECTRON DIFFRACTION METHODS, by Otto Bastiansen. Annual technical rept. for 1 Apr 58-30 June 59 on Contract AF 61(052)72. 24 July 59, 48p. 10 refs. AFOSR-TN-59-905.
Order from LC mi$3.30, ph$7.80 PB 146 183

Contents:
An electron diffraction investigation of the molecular structure of allene, by Almenningen, O. Bastiansen and M. Traetteberg
Electron diffraction studies of the molecular structure of naphthalene and coronene in the vapour state, by Almenningen, O. Bastiansen and F. Dyvik
Preliminary electron diffraction studies of butatriene, by Almenningen, O. Bastiansen and M. Traetteberg

Physical Chemistry

Aerosciences Lab., General Electric Co., Philadelphia, Pa.
ON SOME UNSTEADY FREE MOLECULAR SOLUTIONS TO THE BOLTZMANN EQUATION, by E. Kornowski. Rept. on Contract AF 04(647)269. Nov 59, 22p. 4 refs. Technical Information Series R59SD463.
Order from LC mi$2.70, ph$4.80 PB 146 820

The unsteady free molecular solutions to the Boltzmann equation are found for the filling of regions whose configurations are a channel, cylinder, and sphere. The density profiles, as a function of space and time, are presented. It is shown that the density profiles obtained for the filling of the cylinder can be applied toward obtaining the density profiles aft of a sphere moving through a rarefied gas.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
INVESTIGATION OF THE HYDROGEN-OXYGEN FUEL CELL, by H. Hunger. 15 Dec 58, 56p. 36 refs. USASRDL Technical rept. 2001; AD 219 732.
Order from LC mi$3.60, ph$9.30 PB 147 388

Results are presented to advance the general knowledge of fuel cells and to provide a basis for the construction of a practical hydrogen-oxygen fuel cell. New information, offered as a result of this investigation, includes the importance of a preliminary CO_2 gas activation on the current carrying ability of the hydrogen electrodes, the theoretical conclusions concerning gas transportation to the reaction zone, and the influence of the wet-proofing treatment on this transportation. These theoretical considerations, amply supported by experiments, present new concepts regarding the choice of electrode carriers and surface qualities of the pores. (Author)

Bryn Mawr Coll., Pa.
FUNDAMENTAL ASPECTS OF THE DIELS-ALDER REACTION, by Harold Kwart, Isabel Burchuk, and Christel Kappes. Technical rept. on Contract [Nonr-018(00)]. 15 June 51, 31p. 29 refs.
Order from LC mi$3.00, ph$6.30 PB 147 129

Various aspects of the theories advanced to depict the mechanism of the Diels-Alder reaction are discussed. Various quantitative measurements are in progress which may permit a decision between alternative suggestions offered in explanation of retrodiene decomposition. Factors that determine the ease of formation and stability of an adduct are being studied. Several observations are reported which point up precise lines of experimentation. A very versatile Diels-Alder system has been prepared and identified and its properties reported for the first time here. The design and construction of a special spectrophotometer is reported, which will enable us to make rapid and accurate measurements of the quantities sought.

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE SPECIFIC HEATS OF $NiCl_2 \cdot 6H_2O$ AND $CoCl_2 \cdot 6H_2O$ BETWEEN 1.4° AND $20^\circ K$, by W. K. Robinson and S. A. Friedberg. Technical rept. no. 5 on Contract Nonr-760(05). 20 July 59, 29p. 27 refs. AD-219 870.
Order from LC mi$2.70, ph$4.80 PB 147 088

The specific heats of $NiCl_2 \cdot 6H_2O$ and $CoCl_2 \cdot 6H_2O$ have been measured from 1.4° to $20^\circ K$. Lambda-type anomalies were observed at $5.34^\circ K$ and $2.29^\circ K$ for $NiCl_2 \cdot 6H_2O$ and $CoCl_2 \cdot 6H_2O$, respectively, associated presumably with antiferromagnetic-paramagnetic transitions. It has been possible in each case to separate out the magnetic contribution to the specific heat and thus to compute the total magnetic entropy gained in the transition from the fully ordered to completely disordered condition. This quantity was found to be given accurately by R in $(2S + 1)$ with $S = 1/2$ for Co^{++} and $S = 1$ for Ni^{++}. Short range order is particularly pronounced in these substances, the fraction of the total magnetic entropy gained above the Néel point being 0.52 for $CoCl_2 \cdot 6H_2O$ and for 0.40 for $NiCl_2 \cdot 6H_2O$. Other features of the anomalies are discussed. (Author)

City Coll. of the City of New York.
CATHODIC FORMATION OF METAL HYDRIDES, by Bernard Goldschmidt and Hugh W. Salzberg. Technical rept. no. 2 on Arsine Evolution at Arsenic Cathodes, Contract Nonr-1597(02). 9 Jan 58, 15p. 8 refs.
Order from LC mi$2.40, ph$3.30 PB 137 956

The overall purpose is the study of hydrogen evolution in acid solutions at low current densities, using chemical methods. The arsenic-arsine system was selected for study since arsine is known to form at low current densities and furthermore, methods for determination of microgram quantities of arsine have been worked out.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
GRAPHICAL COMPUTATION OF SHOCK AND DETONATION WAVES IN REAL GASES, by George H. Markstein. Rept. on Project Squid, Contract Nonr-1858(25). May 59, 16p. 5 refs. Technical rept. CAL-78-P.
Order from LC mi$2.40, ph$3.30 PB 146 447

The conservation relations across a shock or detonation wave are represented in the form of a graph applicable to real gases of arbitrary composition. Computation of shock waves reflected from a closed end is performed by means of another universally applicable graph. (Author)

Cryogenic Lab., Ohio State U. Research Foundation, Columbus.
THERMAL, STRUCTURAL, ELECTRICAL, MAGNETIC AND OTHER PHYSICAL PROPERTIES OF THE GROUP V ELEMENTS: TANTALUM, NIOBIUM (COLUMBIUM) AND VANADIUM, by Esther Richert, C. W. Beckett, and H. L. Johnston. Rept. on Contract W33-038-ac-17721. 1 Dec 49, 64p. 29 refs. ATI-81 819; 102-AC49/11-100.
Order from LC mi$3.90, ph$10.80 PB 147 562

The data on the physical properties of the metals, tantalum, niobium (columbium), and vanadium which have been published in the scientific literature during the period between 1917 and 1948 are summarized in this report. Emphasis has been given to the thermal properties. Thermal functions were calculated for these metals. Other physical properties discussed in this report are melting and boiling points, atomic weight and isotopic constitution, crystal structure, compressibility, thermal expansion, spectral emissivity and electrical properties. (Author)

Fairchild Engine Div., Deer Park, N. Y.
EXPLORATORY STUDIES OF COMBUSTION IN SUPERSONIC FLOW, III. CHEMICAL REACTIONS IN A SUPERSONIC BOUNDARY LAYER. IV. SUPERSONIC FLAME STABILIZATION, by Walter Chinitz and Robert A. Gross. Rept. on Project Squid, Contract Nonr-1858(25). June 59, 26p. 6 refs. Technical rept. FED-1-R-P.
Order from LC mi$2.70, ph$4.80 PB 146 517

This report discusses experiments in the stabilization of flames in supersonic flow and chemical reactions in the boundary layer of a flat plate immersed in a supersonic stream. This research was carried out in the steady-state supersonic tunnel.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
EFFECTS OF X-RAY AND GAMMA RAY IRRADIATION ON THERMAL DECOMPOSITION OF SOLID AMMONIUM PERCHLORATE, by Eli S. Freeman and David A. Anderson. Apr 60, 29p. 8 refs. Technical rept. 2673.
Order from LC mi$2.70, ph$4.80 PB 144 527

The low-temperature solid state thermal decomposition of ammonium perchlorate was appreciably enhanced by pre-irradiation with X-ray and gamma ray radiation. This increase in chemical reactivity occurred in three stages, (a) before and during crystalline transition from 200° to 260°C, (b) over the temperature range of 260° to 310°C, and (c) over the temperature range of 310° to 385°C. These results were obtained by differential thermal analysis and thermogravimetric experiments carried out under ambient and reduced pressures at the nominal heating rate of 5°C per minute. The sensitivity of the various stages of reaction to exposure dose, as shown by the relative variation in the parameters of the differential thermal analysis reaction bands, indicates the possibility of using the solid state decomposition of ammonium perchlorate for dosimetry. The decomposition spectrum of samples of sublimed ammonium perchlorate was found to be similar to that of irradiated samples. The effects of impurities formed during irradiation; doping with silver, cupric, and iodide ions; recrystallation; and partial decomposition were also investigated. From microscopic observations, it appeared that there were preferential sites of reaction in the interior of the irradiated crystals. The increased chemical reactivity of irradiated ammonium perchlorate is attributed to positive holes and other defects formed during irradiation which favor the electron transfer mechanism of decomposition. (Author)

Florida U. Engineering and Industrial Experiment Station, Gainesville.
FLUOROCARBON NF COMPOUNDS, by J. A. Young and R. D. Dresdner. Quarterly technical rept. no. 2, 1 Oct-31 Dec 59, on Contract DA 01-009-ORD-772. [1959] 18p. 5 refs. AD-231 426.
Order from LC mi$2.40, ph$3.30 PB 145 716

The electrochemical fluorination of pyridine is described. At a lower voltage than reported heretofore, a much larger yield of the coupled product, dipiperidyl, was obtained. A convenient and efficient method for the production of N_2F_4 has been found, which consists of bubbling NF_3 through heated mercury in a steel reactor. At a temperature of 323°C and a contact time of the order of 30-60 seconds, N_2F_4 was obtained in yields of 60-100% and conversions per pass as high as 60%, on 10 gram runs. Spectral evidence indicated that N_2F_2 was also formed in small quantity. The addition of N_2F_4 to $CF_3CF{=}CF_2$ in a flow system over a CsF surface is under study. Preliminary results show that reaction occurs at 250°, but the products have not yet been identified. Although efforts to prepare $(CF_3CO)_2NBr$ for addition to fluorinated olefins have so far been unsuccessful, it has been found that N-alkyl amides can be added directly to olefins, and a 52% yield of adduct was obtained from $CF_3CF{=}CF_2$ and $CF_3CONHCH_3$. The reaction is currently being extended to the imides $(R_FCO)_2NH$. Indirect fluorination of imides with AgF_2 leads to cleavage of the amide linkage. $(CF_3CO)_2NH$ gave CF_3COF and $CF_3N{=}C{=}O$, while $CF_2(CF_2CO)_2NH$ gave only a solid product, possibly the silver salt of the imide. A possible mechanism for the reaction is described. (Author) (See also PB 144 131)

Florida U. Engineering and Industrial Experiment Station, Gainesville.
FLUOROCARBON NF COMPOUNDS, by J. A. Young and R. D. Dresdner. Quarterly technical rept. no. 3, 1 Jan-31 Mar 60, on Contract DA 01-009-ORD-772. [1960] 16p. 6 refs.
Order from LC mi$2.40, ph$3.30 PB 147 006

Contents:
A laboratory scale preparation of N_2F_4
The reaction of perfluoropiperidine (PPP) with perfluoropropene
Fluorocarbon acyl radical reactions
Indirect fluorination of fluorocarbon nitrogen compounds
Replacement of acyl groups on N_2 by F_2
(See also PB 145 716)

Illinois U., Urbana.
ON THE DETERMINATION OF DIFFUSION COEFFICIENTS IN CHEMICAL DIFFUSION, by R. W. Balluffi. Rept. on Contract AF 18(603)106. 11 Feb 60, 11p. 10 refs. AFOSR-TN-60-239.
Order from LC mi$2.40, ph$3.30 PB 146 444

The equations describing chemical diffusion in the general case where the partial molal volumes of the diffusing components may differ and may vary with composition are reviewed and discussed. The results should replace the standard Darken equations and Boltzmann-Matano analysis.

Illinois U. Engineering Experiment Station, Urbana.
PREPARATION AND PROPERTIES OF PHOSPHIDES AND SILICIDES AND SOME ELECTROCHEMICAL STUDIES, by S. S. Hsu, P. N. Yocom and others. Final rept. for 1 July 53-31 Dec 58 on Contract N6ori-071(50). [1959] 6p. 7 refs. AD-218 784.
Order from LC mi$1.80, ph$1.80 PB 147 079

Attempts were made to develop anodes suitable for electrochemical use. The following phosphides were prepared in a pure state by fused salt electrolysis: Ni_3P, Ni_7P_3, Ni_2P, Co_2P, and Mo_3P. MoP, MnP, W_3P, and WP were also prepared. A cast of Ni_2P was prepared and subjected to metallographic examination. Attempts to cast the Fe_2P-Ni_2P and Co_2P-Ni_2P systems were successful. Cast samples, particularly the mixed phosphides, were generally more resistant to corrosion in all solutions than powders. A cast Ni_2P microelectrode was found which was more suitable as an anode than one of sintered CrP. A correlation of the corrosion efficiencies of microanodes of single phosphides indicated that FeP was most resistant in acid and Ni_2P in alkali. Precision lattice constants of Ni_3P (tetragonal), Ni_2P (hexagonal), Fe_2P (hexagonal), Co_2P (orthorhombic), and W_3P (tetragonal) were found from powder X-ray diffraction patterns by the least squares method. Investigations were made of the compositions of the baths and the course of the electrolysis. Direct combination of the elements was found to be more satisfactory than fused salt electrolysis for the preparation of silicides of Fe, Co and Ni. A study of the electrolysis of pure sodium metaphosphate at 900°C was conducted. Attempts were made to prepare and study the behavior of silicides as anodes with a study of an Fe-P-Si system.

Instituto di Metallurgia e Metallografia, Universita' degli Studi di Roma (Italy).
STUDY ON THE BEHAVIOUR OF DEFECT METALLIC SURFACES OF SINGLE-CRYSTALS IN OXIDATION EXPERIMENTS UNDER CONTROLLED ATMOSPHERE, by Felice de Carli. Final technical rept. for 1 Nov 59-30 Jan 60 on Contract DA 91-591-EUC-1022-01-1175-59. [1960] 16p. 37 refs.
Order from LC mi$2.40, ph$3.30 PB 145 954

1. Development of a thermal-etching method to visualize point defects on cleavage surfaces of zinc single-crystals. 2. Effects of X-rays on the oxidation in a controlled atmosphere of cleavage surfaces of zinc single-crystals. 3. Oxidation of cleavage surfaces of zinc single-crystals previously plastically deformed. 4. Effects of ultrasounds on the oxidation of cleavage surfaces of zinc single-crystals.

James Forrestal Research Center, Princeton U., N. J.
BURNING RATES OF SOLID PROPELLANTS, by Gerald Rosen. Rept. on Contract Nonr-1858(25). July 59, 23p. 8 refs. Proj. Squid Technical rept. PR-95-P.
Order from LC mi$2.70, ph$4.80 PB 147 068

The burning mechanism of a solid propellant is described in terms of a pyrolysis law, a premixed laminar flame, and nothing more. A quantitatively accurate burning rate formula is derived from the theory. The predicted burning rate pressure dependence agrees with the experimental results for ammonium perchlorate propellants. (Author)

James Forrestal Research Center, Princeton U., N. J.
GENERALIZATION OF THE LAMINAR FLAME ACTION PRINCIPLE FOR ARRHENIUS-TYPE RATE FUNCTIONS, by Gerald Rosen. Rept. on Contract Nonr-1858(25). July 59, 7p. 2 refs. Proj. Squid Technical rept. PR-94-P.
Order from LC mi$1.80, ph$1.80 PB 147 067

The action principle for the laminar flame can be extended to include reaction rate functions which do not vanish at the cold boundary. The generalization leads to an unambiguous approximation procedure for determining the burning velocity and temperature distribution associated with arbitrarily specified rate functions. (Author)

Linfield Research Inst., McMinnville, Oreg.
RESEARCH ON ELECTROLYTIC MICROMACHINING TECHNIQUES OF REFRACTORY METALS FOR USE IN FIELD EMISSION DEVICES: I. THE PROPERTIES OF ANODICALLY FORMED OXIDE FILMS ON TUNGSTEN, by H. W. Pitman and D. C. Hamby. Final rept. for 15 July 58-15 Sep 59 on Contract DA 36-039-sc-78191. [1959] 95p. 33 refs. AD-230 953.
Order from LC mi$5.40, ph$15.30 PB 146 794

The properties of anodically formed oxide films on tungsten have been investigated in the ionic current density range from 0.037 to 8.6 ma/cm^2. The validity of the exponential law $i_+ = a \exp \beta F$ has been established for the anodic oxidation of tungsten in 0.1 N

sulfuric acid at 25.0°C. Expressions relating the field F in the film during anodization have been deduced. Agreement between the coulometric and optical measurements is about 4 percent, the chief source of difference being in the relatively low accuracy of the density determination, required in the interpretation of the coulometric data. The constants found for the exponential law are $\log_{10} \alpha = -12.45 \pm 0.3$, α being expressed in ma/cm^2; $\beta = (5.22 \pm 0.08) \times 10^6$ cm/volt. (See also PB 146 496)

Little, Arthur D., Inc., Cambridge, Mass.
A NEW INSTRUMENT FOR THE DETERMINATION OF MOLECULAR WEIGHT BY DIFFERENTIAL VAPOR PRESSURE, by Norman M. Wiederhorn, Jay H. Vreeland, and Ruby H. Thomson. Rept. for Oct 58-Oct 59 on Experimental Techniques for Materials Research, Contract AF 33(616)5483. Feb 60, 16p. WADC Technical rept. 59-724.
Order from OTS $0.50 PB 161 711

The differential vapor pressure molecular weight instrument developed previously was subjected to use and further evaluated with regard to sensitivity, reproducibility, and accuracy. To do this, a number of materials having molecular weight in the range 300 to 20,000 were used. The device is capable of measuring number average molecular weights up to 2000 at solution concentrations of 0.1% (gms/100cc). In order to extend the range of the instrument to molecular weights of 20,000, it is necessary to work with at least 1% solutions. At these concentrations, the instrument is accurate to approximately ± 5%. A glass valve assembly and metal-coated Mylar sensing foils have been developed for use with the instrument. These facilitate the manipulations when making measurements and minimize maintenance problems. (Author) (See also PB 151 832)

New York State Coll. of Ceramics, Alfred U.
CHEMICAL-PHYSICS OF CATALYST SURFACES, by T. J. Gray. Rept. on Contract AF 49(638)288. [1959] 17p. 15 refs. AFOSR-TN-60-413.
Order from LC mi$2.40, ph$3.30 PB 147 495

A model is presented representing the electronic constitution of the surface of a catalyst based on the band theory of solids. It follows implicitly that there will be a direct correlation with any process involving a variation of the electron cloud distribution as occurs during chemisorption and reaction processes. Measurements of the electronic properties of the surface region of catalysts under dynamic conditions afford valuable indirect methods for determining the kinetics of adsorption, reaction and desorption processes in great detail. The model leads to the possibility of qualitative prediction of the action of certain promoters and suggests possible ways of modifying selectivity. The model is general in applicability and covers photocatalytic processes which are demonstrated to make possible the applicational use of high efficiency photochemical processes. Direct correlation is suggested with the photocatalytic syntheses in biochemical reactions. (Author)

Noyes Chemical Lab., U. of Illinois, Urbana.
ELECTRON SPIN RESONANCE STUDIES OF SEMIQUINONES AND THE C-F BOND, by D. H. Anderson Peter J. Frank, and H. S. Gutowsky. Technical rept. no. 19 on Contract Nonr-1834(13). 26 May 59, 30p. 41 refs. AD-219 834.
Order from LC mi$2.70, ph$4.80 PB 146 448

The electron spin resonance spectrum has been observed for a solution of tetrafluoro p-benzosemiquinone and a value, $a_F = 4.14 \pm 0.08$ gauss, obtained for the fluorine hyperfine splitting. It is concluded that this splitting is caused by the σ-π configuration interaction proposed for protons attached to an aromatic free radical. The results show that the fluorine orbital in the C-F bond contains about 5% s-character. The electron spin density, ρ_C, at a carbon atom in an aromatic free radical is related to a_F, for a fluorine bonded to the carbon, by the approximate relation $a_F = 39\rho_C$. Data are presented which can be explained by assuming the semiquinone free radicals produced by air oxidation of hydroquinones in alcoholic KOH dimerize or otherwise react in concentrated solution to give radicals with oxygen linkages, while dibenzosemiquinone radicals are produced from quinones under reducing conditions. A brief description is given of the X-band spectrometer which was used, and also the details of an electronic device to sweep the field of the electromagnet. (Author)

Oxford U. (Gt. Brit.)
A STUDY OF DIFFUSION IN A REACTING SYSTEM, by P. G. Dickens, D. Schofield, and J. Walsh. Rept. on Contract AF 61(514)1117. Feb 60, 18p. 9 refs. AFOSR-TN-59-868.
Order from LC mi$2.40, ph$3.30 PB 147 106

The purpose of the present work was to derive and solve numerically the diffusion equation in the general case. The results are compared with the solutions obtained by the earlier approximate treatments, thus enabling the range of validity of such treatments to be properly assessed.

Polytechnic Inst. of Brooklyn, N. Y.
A THEORY OF ELECTRON TRANSFER PROCESSES AT ELECTRODES, by R. A. Marcus. Technical rept. no. 2 on Contract Nonr839(22). 1 July 59, 16p. 5 refs. AD-218 735.
Order from LC mi$2.40, ph$3.30 PB 147 076

The foundations of a quantitative theory of electron transfer processes at electrodes are described. A weak electronic interaction was assumed between the electrochemically active ion and the electrode. The quantum mechanical consequences of this assumption were investigated. The results indicated that the atomic coordinates of the activated complex are those which lie on a many-dimensional surface lying at the intersection of 2 potential energy surfaces. The surfaces are those which are obtained for each of the 2 redox states of the ion-electrode system in the hypothetical case of zero electronic interaction. A method was outlined for determining the free energy of formation of the activated complex. This calculation

permits the computation of the current and its dependence on activation over potential. Depending on the extent of electronic interaction, electron transfer was shown to proceed adiabatically or nonadiabatically. Applications of the Franck-Condon principle in qualitative discussions of electron transfers in solution and at electrodes and their relation to the theory outlined above were examined. Some conclusions based on the behavior of the one-dimensional potential energy curves were questioned since the important part played by the rearrangement of the atomic configuration of the entire system in an electron transfer was not recognized.

Princeton U., N. J.
CONSIDERATION OF HYDRAZINE DECOMPOSITION, by I. J. Eberstein and I. Glassman. Technical rept. on Contract AF 18(600)1527. 11 Dec 59, 24p. 23 refs. Aeronautical Engineering Lab. rept. no. 490; AFOSR-TN-60-352.
Order from LC mi$2.70, ph$4.80 PB 146 901

A brief investigation of the molecular structure of hydrazine is presented. Catalysis of hydrazine decomposition on metal surfaces is discussed. It was found that metals having incomplete d-subshells act as strong catalysts for hydrazine decomposition, whereas metals having no d-subshells, or complete d-subshells act as non-catalysts. Initial steps for hydrazine decomposition under various conditions are proposed and inhibitors for such decomposition are suggested. Inhibitors may be ammonia, aniline, toluene, and xylidene or toluidene.

Queen Mary Coll., U. of London (Gt. Brit.)
THE STUDY OF FREE-RADICAL INTERMEDIATES FORMED DURING THE OXIDATION OF ORGANIC MESOMERIC COMPOUNDS BY METAL IONS IN SOLUTION BY MEANS OF ELECTRON SPIN RESONANCE SPECTROSCOPY. Annual technical rept. for 1 Oct 58-30 Sep 59 on Contract DA 91-591-EUC-945. [1959] 9p. AD-233 210.
Order from LC mi$1.80, ph$1.80 PB 146 832

It was proposed to investigate the oxidation of organic compounds by compounds of the transition metals. In these reactions free-radicals are often postulated as intermediates and a sensitive electron-spin resonance spectrometer for the detection of such radicals has been constructed. The spectrometer has been used to study the oxidation of 2:6-ditertiarybutylphenol. (Author)

Stanford Research Inst., Menlo Park, Calif.
THE DEPTH OF THE SURFACE ZONE OF A LIQUID, by J. C. Henniker and J. W. McBain. Technical rept. no. 5 on Properties of Surfaces, Contract N6ori-154, T.O. 2. 31 Mar 48, 44p. 175 refs. ATI-63 755.
Order from LC mi$3.00, ph$7.80 PB 146 951

Data from widely scattered sources indicate that the molecules of many liquids are highly oriented in the neighborhood of surfaces. A group of 175 references is presented in the order of the degree of certainty with which they demonstrate deep surface orientation.

Stanford Research Inst., Menlo Park, Calif.
IONIZATION IN FLAMES: THE ROLE OF COMPLEX HYDROCARBONS AND THE IONIZATION OF MIXTURES, by Felix T. Smith. Technical rept. 1 on Contract AF 04(645)66. May 57, 43p. 38 refs. WDD Doc. no. 7-5190; AD-216 841.
Order from LC mi$3.30, ph$7.80 PB 147 022

Research on flame ionization led to several equilibrium considerations. A survey of the experimental and theoretical information on ionization potentials of organic compounds showed that many of them, which may be present in flames (in small quantities individually, but in a noticeable amount in the aggregate), can be very readily ionized. Expressions that can be used in calculating the equilibrium ionization to be expected from mixtures of such species and other materials are developed. With regard to nonequilibrium processes, a possible role is suggested for large organic molecules and small carbon particles. They may accumulate energy from small excited molecules, and become hot enough to ionize, giving up this energy only rather slowly to the translational and rotational motion of the gas. The evaluation of this and other possible nonequilibrium processes requires study of time-dependent processes such as the growth, reactions, decay, and mechanisms of energy transfer of large molecules in flames.

Ultrasonic and Electrochemistry Research Lab., Western Reserve U., Cleveland, Ohio.
THE STUDY OF THE KINETICS OF THE HYDROGEN, OXYGEN, AND RELATED ELECTRODES, by Ernest Yeager, Harry Dietrick, and Frank Hovorka. Technical rept. no. 1 on Contract Nonr-581(00). 15 Dec 51, 43p. ATI-170 028.
Order from LC mi$3.30, ph$7.80 PB 147 809

The problems associated with the use of oxygen gas and hydrogen gas as anode and cathode materials in primary cells are discussed in terms of kinetics of these electrodes. The electronic instrumentation to be used for the polarization measurements is described with respect to design and operation. Emphasis is placed upon the determination of the rate of decay and build-up of the polarization at individual electrodes.

Washington U. [Seattle]
THE REACTION OF PEROXYDISULFURYL DIFLUORIDE WITH SULFUR DIOXIDE AND WITH FLUORINE, by George H. Cady and John E. Roberts (Massachusetts U). Technical rept. no. 22 on Contract Nonr-477(16). 1959, 7p. 6 refs.
Order from LC mi$1.80, ph$1.80 PB 147 070

Peroxydisulfuryl difluoride reacts with fluorine to give fluorine fluorosulfonate and with sulfur dioxide to give a compound of empirical formula $S_3O_8F_2$. The latter has been characterized. (Author)

EARTH SCIENCES

British Columbia U. (Canada).
THE MORPHOLOGY OF GEOMAGNETIC MICROPULSATIONS, Pc, by J. A. Jacobs and K. Sinno.

Scientific rept. no. 1 on Contract AF 19(604)4068. 19 June 59, 18p. 9 refs. AFCRC-TN-59-468.
Order from LC mi$2.40, ph$3.30 PB 146 152

An analysis of the occurrence frequency of geomagnetic micro-pulsations Pc has been carried out using data obtained during the IGY from a world-wide network of stations.

Massachusetts U., Amherst.
OBSERVATIONS ON PHOTO INTERPRETATION OF CAROLINA "BAYS" AND ASSOCIATED FEATURES, by David Jon Hagar (U. of Maine). Technical rept. no. 2-A on Contract Nonr-2242(00). July 59, 41p. 7 refs. AD-220 753.
Order from LC mi$3.30, ph$7.80 PB 147 095

In order to provide a basis of comparison for photo interpreters dealing with the Carolina "bays" or with comparable features in regions having similar climatic characteristics, the report endeavors to correlate the expression of selected bays as seen on air photos with actual conditions on the ground as determined by field observations. For each of seven areas covered, the following are discussed: location; setting; topography; drainage; surficial material; vegetation; and passability. Generalized conclusions concerning the areas discussed were outlined.

Climatology and Meteorology

Air Weather Service, Scott AFB, Ill.
AWS TERMINAL FORECAST (TFAWS CODE). 1 Apr 57, 14p. AWSM 105-25 and AWSM-105-25A, 11 Feb 59; supersedes AWSM 105-25, 1 July 54; AWSM 105-25A, 1 Nov 54; AWSM 105-25B, 1 Feb 55; and AWSM 105-25C, 15 Feb 56.
Order from LC mi$2.40, ph$3.30 PB 146 947

Air Weather Service Terminal Forecast Code (TFAWS) groups are appended to surface observations to set forth forecast cloud height or ceiling, visibility and weather at terminals during a definite period of time. The TFAWS code groups are intended as an aid to pilots and the briefing forecaster. Because of limited teletypewriter time and the relatively few code groups transmitted, it is impossible to give a complete picture of the terminal weather using TFAWS code groups. The TAFOR code (FM 51.A) is a more complete terminal forecast code.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
DOUBLE-DIRECTION-FINDING ROCKET METEOROLOGICAL SENSING SYSTEM, by D. E. Cline. 15 July 58, 29p. USASRDL Technical rept. 1981.
Order from LC mi$2.70, ph$4.80 PB 146 932

A proposal is presented for a meteorological rocket system for sounding the winds to approximately 200,000 feet, with an inherent capability for telemetering other meteorological parameters. The system would be composed of a Loki rocket, 1680-mc transmitter with special antenna, wafer-cell battery, suitable switching for the transmitter, parachute, and means for ejecting the instrumentation at the peak of the missile's trajectory. The geometry of the problem is similar to the determination of winds aloft utilizing two theodolites on a known baseline. It is concluded that a High-Altitude Double-Direction-Finding System possesses many advantages over presently devised systems, and that with a modest expenditure of time, money, and manpower, a working system could be evolved which would serve as both a research tool and an operation item for use at rocket proving grounds. (Author)

California U., Los Angeles.
THE INFLUENCE OF TERRAIN AND THERMAL STRATIFICATION ON FLOW IN THE SURFACE AND PLANETARY BOUNDARY LAYERS, by James G. Edinger and Shih-Kung Kao. Final rept. on Contract AF 19(604)2424. 30 Sep 59, 39p. 31 refs. AFCRC-TR-59-401.
Order from LC mi$3.00, ph$6.30 PB 146 931

Contents:
Wind structure in lowest 5km over Santa Monica, California
Stationary flow in the planetary boundary layer with an inversion layer and a sea-breeze
Turbulent transfer in the boundary layer of a stratified fluid

Imperial Coll., London (Gt. Brit.)
CALIBRATION OF A WEATHER RADAR USING A STANDARD TARGET, by D. Atlas and S. C. Mossop. Technical (Scientific) note no. 1 on Contract AF 61(052)254. Sep 59, 19p. 6 refs. AFCRC-TN-59-477; AD-231 806.
Order from LC mi$2.40, ph$3.30 PB 146 818

A simple method is described for calibrating a weather radar by means of a standard spherical target, thus permitting the radar to be used for quantitative measurements of storm reflectivity. The technique involves determination of that storm reflectivity which provides an echo equivalent to that from the known target. The sphere, suspended from a balloon, is tracked as it leaves the radar site. Its echo is "measured" by reducing the receiver gain control to the threshold of visibility. The threshold gain setting is thereby calibrated and subsequently provides an accurate measure of storm reflectivity. There is no need for any other test equipment such as a microwave signal generator. Absolute accuracy is greater than that attainable with a signal generator since no reliance need be placed on the generator calibration or upon the specified antenna gain. (Author)

Laboratory of Climatology, Centerton, N. J.
MICROCLIMATIC INVESTIGATIONS AT POINT BARROW, ALASKA, 1956, by J. R. Mather and C. W. Thornthwaite. Technical rept. no. 1 [on Contracts N7onr-367(01) and Nonr-1138(01)] 1956, 47p. 4 refs. Publications in Climatology vol. 9, no. 1.
Order from LC mi$3.30, ph$7.80 PB 137 849

This report provides an evaluation of the current program of microclimatic observations in the Arctic. Because of the fact that climatic observations can be

accumulated only slowly, it is clear that it will be necessary to continue the program of observations at Point Barrow for a number of years before the expected results can be obtained from the research study.

Little, Arthur D., Inc., Cambridge, Mass.
OBSERVATIONS OF THUNDERSTORMS IN NEW MEXICO, by C. B. Moore, B. Vonnegut, and A. G. Emslie. Rept. on Contract Nonr-1684(00). 15 June 59, 117p. 46 refs. AD-220 039.
Order from LC mi$6.00, ph$18.30 PB 146 826

Contents:
Description of observatory
Potential-gradient changes during thunderstorms
Point-discharge currents and the electrical charge on rain
Relation of point discharge to rain currents
Computation of raindrop charging
Rain gushes following lightning
Raindrop collection efficiencies
Rapid appearance of rain from clouds in New Mexico
Computation of raindrop collection efficiencies in electrified clouds.
Effects of electric field on colliding water drops
Formation of rain by coalescence

Massachusetts Inst. of Tech., Cambridge.
FINAL REPORT, by Pauline M. Austin. Rept. for 1 Mar 56-30 Nov 57 on Weather Radar Research, Contract DA 36-039-sc-71136. 31 Dec 57, 27p. AD-153 903.
Order from LC mi$2.70, ph$4.80 PB 147 387

The basic purpose of this project is to conduct a program of experimental and theoretical research in the field of weather radar. This program includes evaluating the radar as a meteorological instrument, devising and testing additional instrumentation for meteorological observations, and taking observations and using them in meteorological research. Major aspects of the research are, therefore, instrumentation, observation, analysis of data and pursuance of related theoretical studies.

New York U. Coll. of Engineering, N. Y.
ON THE VERTICAL PROPAGATION OF A DISTURBANCE THROUGH THE MESOSPHERE, by Katsuyuki Ooyama. Scientific rept. no. 6 on Contract AF 19(604)1738. Sep 58, 77p. 14 refs. AFCRC-TN-58-499.
Order from LC mi$4.50, ph$12.30 PB 137 835

The vertical propagation of a hydrodynamical disturbance, in which the latitudinal variation of the Coriolis parameter is the only cause of wave propagation, is studied in connection with possible solar-weather relationships. The effect of a vertically variable stratification in the mesosphere on the vertical transmission of the disturbance is first examined. Then, the three-dimensional Green's function of the Rossby wave equation with constant coefficients is derived by making use of the method of stationary phase, and the energy propagation is discussed. Relative accumulation of the energy along the forerunner of disturbance, which proceeds in all directions from the initial point source of the disturbance with the maximum group velocities for the respective directions, is shown to take place. However, within several weeks after the initial disturbance, the forerunner does not become well developed; and the energy density propagated with the maximum group velocity is insignificant when compared with that propagated more slowly, if the size of the initial disturbance is within the range considered here. The speed of the maximum disturbance is found to depend to a great extent on the initial size. The estimate of possible magnitudes of such a disturbance, which might be induced by a corpuscular stream in the high atmosphere and propagated downward, is given in terms of the vertical velocity. (Author)

Operations Research, Inc., Silver Spring, Md.
THE SCATTERING OF THERMAL RADIATION BY CLOUDS, by Donald A. Melnick and J. K. Bragg. Scientific rept. no. 2 on Contract AF 19(604)1422. 4 Dec 57, 25p. 4 refs. Technical paper no. 6.
Order from LC mi$2.70, ph$4.80 PB 137 560

This paper is a summary of certain theoretical results on the transmission of thermal radiation. In the first part, a solution to the problem of transmission of thermal radiation through a layer of scattering particles is derived by two approximation methods. The result is given as a function of angle of incidence, and a scattering parameter of the medium. Although approximate, this solution is more accurate than the precision of measurements which can usually be made in the field or in the laboratory. The second part contains certain practical but less exact approximations necessary to apply these results to the problem of scattering of radiation by clouds. (Author)

Radiobiological Lab., U. of Texas, Austin.
A CORRELATION ANALYSIS OF THE RELATIONSHIP BETWEEN WEATHER VARIABLES AND ATMOSPHERIC RADIOACTIVITY, by J. A. Davis, Loren C. Logie (School of Aviation Medicine) and others. Feb 60, 8p. 8 refs. AFSAM rept. 60-35.
Order from LC mi$1.80, ph$1.80 PB 147 457

Correlation analysis between various surface weather parameters and samples of atmospherically borne radioactive material has been performed. The material collected was primarily of natural origin (i. e., radon and thoron). The analysis suggests that the natural radioactive material is transported into the Austin area within the turbulence associated with a cold frontal passage and concentrated in the lower air layers by the ensuing elevated temperature inversion.

Technical Operations, Inc., Burlington, Mass.
ANALYSIS OF THE PERFORMANCE OF THE AVIATION WEATHER SYSTEM. VOLUME I. SUMMARY, CONCLUSIONS, RECOMMENDATIONS, by Roger F. Willis, Donald Schimelfenyg, and Theodore W. Schwenke. Final rept. on Contract FAA/BRD-39. 30 Dec 59, 71p.
Order from OTS $2.00 PB 161 751-1

The conclusions and recommendations are based on a time analysis of the aviation weather system and a study of the effect of age on the credibility of weather information. The aviation weather system, as studied, includes the weather services provided by the U.S. Weather Bureau, the Air Force, the Navy, and the airlines, with emphasis on aviation operations over the continental United States. The conclusions and recommendations are based on the information presently available on such variables as the number of forecast centers in the system, the number and types of airports and air bases, the weather information traffic load, and the configuration of the teletype networks.

Technical Operations, Inc., Burlington, Mass.
ANALYSIS OF THE PERFORMANCE OF THE AVIATION WEATHER SYSTEM. VOLUME II. DISTRIBUTION OF WEATHER INFORMATION; AGE ANALYSIS OF WEATHER INFORMATION; OBSERVATION PROCESS AND INSTRUMENTS; COMMUNICATION SYSTEMS; [and] CREDIBILITY OF WEATHER INFORMATION, by Roger F. Willis, Donald Schimelfenyg, and Theodore W. Schwenke. Final rept. on Contract FAA/BRD-39. 31 Jan 60, 283p. 98 refs.
Order from OTS $4.00 PB 161 751-2

This volume contains details supporting the conclusions and recommendations of volume 1 (PB 161 751-1)

Frost Science

Army Snow, Ice, and Permafrost Research Establishment, Wilmette, Ill.
AIRFIELDS ON FLOATING ICE SHEETS FOR ROUTINE AND EMERGENCY OPERATIONS, by Andrew Assur. Preliminary edition, Jan 56, 25p. SIPRE rept. 36.
Order from LC mi$2.70, ph$4.80 PB 147 184

The recommendations, covering only practical field aspects, are based on theoretical work, field experiments, and practical experience of personnel of the Snow Ice and Permafrost Research Establishment. They follow chronologically the procedures necessary for the establishment and maintenance of airfields on ice.

Army Snow Ice and Permafrost Research Establishment, Wilmette, Ill.
ICE FABRICS AND THE UNIVERSAL STAGE, by Chester C. Langway, Jr. Aug 58, 21p. 35 refs. Technical rept. 62; AD-206 681.
Order from LC mi$2.70, ph$4.80 PB 147 185

A universal stage for laboratory and field use [J. Geol. 49:590-598, 1951] is described, and the techniques of ice-fabric studies are reviewed. The new stage is based on the same principle as that of Fedorow for use on a polarizing petrographic microscope and has 4 axes of rotation. Three of the axes are graduated, one serving as an azimuth control, the other 2 for recording the angle of inclination. The 4th axis allows the entire stage to be rotated on a vertical axis without disturbing the oriented specimen. The stage is mounted between 6-in. disk polaroids and can accommodate a thin section up to 5 in. in diam. The plastic cover plate is etched with a 1-cm grid for direct grain-size measurements and is equipped with a small copper indicator for obtaining azimuth positions. (Author)

Goethe U., Frankfurt (West Germany).
RESEARCH ON RELATIONS BETWEEN ICE NUCLEI AND ATMOSPHERIC AEROSOLS, by Hans-Walter Georgii. Technical (Final) rept. on Contract AF 61(514)927. May 59, 116p. 75 refs. AFCRC-TR-59-288; AD-232 257.
Order from LC mi$6.00, ph$18.30 PB 146 299

Contents:
Survey on recent research on ice formation in the atmosphere
Problems treated in present investigation
Description of instrumental equipment for research on freezing nuclei
Determination of the number of ice particles in the cold chamber
Check of counting process with the method after BIGG
Results of measurements
Measurements at continental locations
Relations between size and number of condensation nuclei and the concentration and activity of freezing nuclei
On the properties of the maritime aerosols for the freezing process in supercooled clouds
Demonstration of the ice-nucleation activity of the atmospheric aerosols by direct methods

Geology

Cornell U., Ithaca, N. Y.
HYDROTHERMAL GEOCHEMISTRY OF IRON, by William T. Holser and Cecil J. Schneer. Final rept. on Contract Nonr-401(07). 15 Aug 57, 62p. 86 refs.
Order from LC mi$3.90, ph$10.80 PB 147 802

The solubility of magnetite was measured in dilute aqueous solutions of HCl at high temperature and pressure. At 390 C, 440 bars, in 0.0002 M HCl, 300 ppm ferrous iron are dissolved. Solubility decreases with acid concentration; in pure water at the same conditions solubility is less than 0.02 ppm. Magnetite was synthesized by reaction of acidic iron chloride solutions with calcite at high temperature and pressure.

Iowa Engineering Experiment Station, Ames.
GEOLOGIC AND ENGINEERING PROPERTIES OF SILTS NEAR BIG DELTA AND FAIRBANKS, ALASKA, by G. F. Lindholm, L. A. Thomas and others. Final rept. 1 on Contract Nonr-530(04). 1 Dec 57, 37 refs.
Order from LC mi$6.90, ph$21.30 PB 137 978

This report is presented in two parts. (1) Study of silts in Big Delta region (2) Study of silts in Fairbanks region.

Physics of the Atmosphere

Free U. of Berlin (Germany).
COLLECTION OF STATISTICAL DATA FOR METEOROLOGICAL STUDIES OF THE UPPER ATMOSPHERE, by P. Beelitz, J. Clauss, and W. Fett. Technical (scientific) note no. 1 on Contract AF 61(052)156. 31 July 59, 44p. 19 refs. AFCRC-TN-59-610; AD-231 784.
Order from LC mi$3.30, ph$7.80 PB 146 817

Nocturnal radiosonde ascents were collected, checked and supplemented for the winter months January, February and March 1955 through 1958 from 56 selected aerological stations in Europe and adjacent areas. As the result, data of pressure height, temperature and wind for the standard pressure levels 700, 500, 300, 200, and 100 mb. as well as the surface data and sea-level pressure are given in a complete form on punched cards, lists and microfilms. The methods and means employed are described. Besides comments on the sources of data and the description of working operations, the synoptic-aerological criticism of the data and the developed scientific-technical resources are given in more detail. The experiences with the individual radiosonde networks are pointed out. A selection of scientifically and methodically interesting printing samples illustrates the methods used. (Author)

Ionosphere Research Lab., Pennsylvania State U., University Park.
FINAL REPORT FOR 1 JANUARY 1955 TO 31 AUGUST 1958, by A. H. Waynick. Rept. on Ionospheric Research, Contract AF 19(604)1304. 30 Sep 58, 56p. 242 refs. AFCRC-TN-58-247.
Order from LC mi$3.60, ph$9.30 PB 137 685

Research included theoretical and experimental investigations on the physics, dynamics and general properties of the ionic layers of the earth's atmosphere. The problems outlined fit under the broad categories of recording programs, electromagnetic studies, solar and high atmosphere physics, ionospheric phenomena and equipment development. Brief descriptions of related work supported by other agencies are included in this portion of the report. Four investigations completed or modified prior to June 1957 complete this material.

Michigan U. [Research Inst.] Ann Arbor.
A RADIOACTIVE-IONIZATION-GAGE PRESSURE-MEASUREMENT SYSTEM, by N. W. Spencer, R. L. Boggess and others. Scientific rept. ES-1 on Contracts AF 19(604) (545, 1511, 1948) and National Science Foundation Grant Y/10.20/249. May 58, 66p. 6 refs. 2597-3-S; AFCRC-TN-58-422; AD-152 590.
Order from LC mi$3.90, ph$10.80 PB 146 501

An air-pressure-measurement system employing a radioactive ionization gage has been developed for use in rockets for the determination of surface pressures which can be interpreted in terms of the ambient pressure, density, and temperature of the atmosphere. The system has proven useful for the measurement of pressures from atmospheric to at least 10^{-3} mb. (Author)

Upper Air Research Labs., U. of Utah, Salt Lake City.
IMPROVEMENTS IN THE FALLING SPHERE INSTRUMENTATION, by Obed C. Haycock. Final rept. on Contract AF 19(604)4956. 10 Feb 60, 28p. 4 refs. AFCRC-TR-60-233.
Order from LC mi$2.70, ph$4.80 PB 147 297

Investigations have been made to improve the circuitry and performance of the falling sphere experiment. A study has been made of the operation of the sphere and conversion from mechanical timing and electronic tubes to solid state devices insofar as the state of the art will permit. The results of a study of the antenna operation at 400 and at 730 mc are also included. (Author)

Oceanography

Martin Co., Baltimore, Md.
A RESEARCH PROGRAM FOR MARINE GROWTH PREVENTION BY ULTRASONICS, by C. W. Waldvogel and J. W. Pieczynski. Rept. for Nov 58-Mar 59 on Contract NOa(s) 56-910-C. May 59, 51p. ER 10764; AD-219 982.
Order from LC mi$3.60, ph$9.30 PB 147 155

A test program was conducted to determine the effectivity of ultrasonics on marine growth. This program utilized ultrasonic vibrations on two 14-ft aluminum hulls in conjunction with two similar boats as controls. For each test, two boats were used, one hull was ultrasonically vibrated, and the other used as a means to determine the amount of growth without vibration. The cleanliness of the ultrasonically vibrated boat hull on all four tests indicates that ultrasonic vibration is effective against marine growth.

Narragansett Marine Lab., U. of Rhode Island, Kingston.
BIOLOGICAL PRODUCTIVITY PROJECT, by David M. Pratt and Harold Berkowitz. Annual progress rept. for 1 Jan-31 Dec 57 on Contract Nonr-396(03). Jan 58, 9p. Reference no. 58-2.
Order from LC mi$1.80, ph$1.80 PB 138 283

Growth rates of the quahog, Venus mercenaria L., in Narragansett Bay have been studied over a three-year period in relation to various environmental factors.

ENGINEERING

Ordnance Tank-Automotive Command [Center Line, Mich.]
PROCEEDINGS OF THE CONFERENCE ON EDUCATIONAL ASPECTS OF LAND LOCOMOTION HELD AT THE UNIVERSITY OF MICHIGAN, ANN ARBOR JANUARY 27 AND 28, 1958, by B. A. Unlendorf, ed. July 58, 33p.
Order from LC mi$3.00, ph$6.30 PB 146 775

Contents:
Interest of ordnance in an educational and research program in land locomotion
Adaptation of curricula to modern needs
New curriculum in automotive engineering
Research and land locomotion
Research in automotive problems
Educational needs in mobility and trafficability
Expanding fields of automotive problems
From components to the vehicle as a whole
Interest of industry in the studies of soils considered as a medium of operation for tools and vehicles

Aeronautical Engineering

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
NEW INHALATION VALVE FOR USE WITH A-13A OXYGEN MASK, TEST AND EVALUATION OF, by E. L. Michel. Final rept. 6 June 56, 13p. TED NAM AE-5166; NAmC-ACEL-286; AD-117 563.
Order from LC mi$2.40, ph$3.30 PB 146 508

The inhalation valves presently incorporated in the A-13A oxygen mask have been cause for considerable concern because of their extreme sensitivity to dirt or other foreign material. This condition which could render oxygen masks inoperable during flight poses a definite hazard to pilots. A new design inhalation valve has been developed by Ensigns R. K. Sutz and L. S. Schonberger, which endeavors to eliminate any mask failures which could be caused by this condition. Results of tests conducted indicate that the subject valves do operationally comply with the requirements specified in specifications MIL-V-7553(ASG).

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A PHOTOMETEORONIC METHOD FOR BOMB BALLISTICS AND FOR MEASUREMENTS OF THE FLIGHT PERFORMANCE OF AIRCRAFT, by R. S. Zug. 26 Sep 42, 94p. Rept. no. 279.
Order from LC mi$5.40, ph$15.30 PB 146 948

The Photometeoronic method utilizes two vertical cameras mounted at opposite ends of a suitable base line. An airplane carrying a flashing light flies by night (or by day, with special equipment) at any desired altitude and between the two cameras each of which records the successive images of the flashing light on a photographic plate. Coincident with each flash a radio signal from the airplane is received and recorded at a ground station, for timing purposes. In range bombing the instant of bomb release is signified by a special flash and radio signal. The data from the photographs and time records yields the course and speed of the plane with high percision, as a function of time.

Boeing Airplane Co. [Seattle, Wash.]
WATER VAPOR PUMP STUDY, by John R. Malcolm. Rept. on Contract AF 33(616)5724. Feb 60, 136p. 10 refs. WADC Technical rept. 59-254.
Order from OTS $2.75 PB 161 705

This report presents the results of a study to determine the feasibility of utilizing a water vapor pump to lower the vapor pressure of a water heat sink to obtain water boiling temperatures in the 40° - 70°F and the 120° - 160°F range, for application in aircraft covering the speed range from Mach 1.5 to 12 and altitude range from sea level to 150,000 feet. The criteria of feasibility was: (a) Can water vapor pumps be built in the size range of interest? (b) What penalty results to the vehicle and how does this penalty compare with alternate methods of absorbing the heat load? The pump types considered are the rotary positive displacement, centrifugal, axial flow and ejectors. Centrifugal compressors, both alone and in combination with an expendable ammonia system, and ejectors combined with an ammonia system are feasible for producing 40° - 70°F boiling on bombers with a flight time in excess of 3 hours. No vapor pumps studied are competitive with alternate schemes for providing a heat sink with 120° - 160°F boiling. (Author)

Chicago Midway Labs., U. of Chicago, Ill.
DETERMINATION OF FACTORS GOVERNING SELECTION AND APPLICATION OF MATERIALS FOR ABLATION COOLING OF HYPERVELOCITY VEHICLES, by John H. Bonin, Channon F. Price, and Henry Halle. Rept. on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5436. Feb 60, 162p. WADC Technical rept. 59-87, pt. 3.
Order from OTS $3.00 PB 161 702

The results obtained from tests of samples of fifty-two different materials are presented. The samples were exposed to the high-temperature plasma discharge produced in an air-stabilized electric arc. The sample shape, test conditions and test procedure, and the material behavior are reported upon. (Author)
(See also PB 161 049)

David Taylor Model Basin, Washington, D. C.
ANALYZING THE STEPLESS PLANING BOAT, by Eugene P. Clement. Nov 56, 42p. 8 refs. Research and development rept. 1093.
Order from LC mi$3.30, ph$7.80 PB 147 036

This report gives methods of presenting and using information on the hull forms and model performance of planing boats to guide the design of future boats. The effects on performance of variations in some of the primary planing boat parameters are illustrated and discussed. A design method is proposed, and data are presented to assist in making correct design decisions. (Author)

Douglas Aircraft Co., Inc., Long Beach, Calif.
COOLING METHODS AND EQUIPMENT FOR SUPERSONIC AIRCRAFT, by G. B. Werth, H. K. McCluer, and B. T. Fitchett. Rept. for 15 May 56-15 Nov 57 on Contract AF 33(616)3723. Feb 60, 159p. 152 refs. WADC Technical rept. 57-619; AD-151 141.
Order from OTS $3.00 PB 161 731

Methods of cooling the cabin and equipment that were considered include (1) air cycle, vapor cycle and absorption cycle refrigeration, (2) rejection of heat to expendable coolants, and (3) relatively unexplored

methods such as vortex tubes, thermoelectric cooling and endothermic reactions. Twenty-eight cooling systems were conceived and analyzed, all of which are classified as storage systems. Six of the more promising systems were evaluated to determine the drag horsepower attributable to each. Further, the design and development problems associated with these systems were evaluated. Storage cooling systems using fuel and water as heat sinks were found to to be the most promising systems investigated.

Flight Control Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
INVESTIGATION OF A TECHNIQUE FOR IMPROVING AIRCRAFT RESPONSE USING A COMPLEMENTARY OPTIMUM-RESPONSE MODEL, by Raymond R. Rath. Sep 56, 81p. 3 refs. WADC Technical note 56-475; AD-110 518.
Order from LC mi$4.80, ph$13.80 PB 147 591

The pitch response of an F-89 aircraft to a command input is investigated using the two-degree of freedom short period mode approximation. The command input is fed into both the airframe-hydraulic servo combination and a black box represented by an "ideal" transfer function of the same order as the airframe transfer function. The two outputs are compared and some function of the difference is fed back to the input of only the airframe-servo system. Several feedback configurations are investigated by means of root-locus techniques. The response of the system with a particular feedback function is determined analytically for seven different flight conditions covering the flight regime of the F-89. A computer solution is then obtained for these seven conditions and the "best" fixed gain for all conditions is determined. The results show that the response of the airframe to a command input remains very close to the response of the "ideal" transfer function. (Author)

General Applied Science Labs., Inc., Westbury, N. Y.
NOTE ON THE BROAD SPECTRUM NOISE OF A JET AND ITS SILENCER, by Sin-I Cheng. Rept. on Contract AF 49(638)194. Nov 59, 24p. 9 refs. GASL Technical rept. no. 149; AFOSR-TN-59-1309.
Order from LC mi$2.70, ph$4.80 PB 147 320

In this note, it is intended to amplify some of the implications of the model for analyzing the broad spectrum noise of a jet as was presented in a previous report when applied to practical systems. Experimental results on the noise reduction by the C. F. 100 Orenda IIR diffuser silencer and by the UTIA Model Ground Muffler are discussed from the points of view of both the Lighthill's model and the present model. Based upon Lighthill's model, it appears necessary to assume a very large increase of the turbulence intensity accompanying the diffusion of the jet velocity. According to the present model, where the change of the turbulence intensity is neglected, the observed noise reduction or increase is explained by the change of the relative thickness of the shear layer that appears to be of reasonable magnitudes. (Author)

Heat Transfer Lab., U. of Minnesota, Minneapolis.
EXPERIMENTAL STUDIES FOR DETERMINING HEAT TRANSFER ON THE RIBBONS OF FIST TYPE PARACHUTES, by P. A. Schoeck, J. N. Hool, and E. R. G. Eckert. Rept. on Contract AF 33(616)3755. Feb 60, 103p. 13 refs. WADC Technical note 59-345.
Order from OTS $2.50 PB 161 745

Experimental heat transfer studies were conducted on models representing the ribbons of Fist type parachutes. The measurements were made in the Reynolds number ranges from $.03 \times 10^5$ to $.6 \times 10^5$ and from 2.5×10^5 to 5×10^5 where the Reynolds number is based on ribbon width and on the average velocity and properties in the slots between the ribbons. Low ratios of the pressures upstream and downstream of the models were connected with the small Reynolds number tests and high pressure ratios with the large Reynolds number experiments. The effect of ribbon spacing (porosity) upon the heat transfer was investigated. The data are presented in dimensionless form. The data can be used for the prediction of convective heat transfer rates on Fist type parachutes during descent. (Author)

Hiller Aircraft Corp., Palo Alto, Calif.
DUCTED PROPELLERS: A CRITICAL REVIEW OF THE STATE OF THE ART, by A. H. Sacks and J. A. Burnell. Rept. on Contract Nonr-2677(00). 26 June 59, 74p. 124 refs. Rept. no. ARD-232.
Order from LC mi$4.50, ph$12.30 PB 146 404

A critical survey is made of the state of the art of ducted propellers. The survey is divided generally into theoretical and experimental research, and a comprehensive table of the latter is presented showing the type and extent of experimental investigations carried out. Specific reports are discussed where appropriate, and various aspects of the ducted propeller problem are considered in some detail. A summary of the state of the art is presented along with some recommendations for future research. (Author)

Human Sciences Research, Inc., Arlington, Va.
AIRPORT MARKING AND LIGHTING SYSTEMS: A SUMMARY OF OPERATIONAL TESTS AND HUMAN FACTORS, by William A. Lybrand, W. S. Vaughan, Jr., and John P. Robinson. Final rept. on Contract FAA/BRD-13. May 59, 230p. 20 refs. HSR-RR-59/1-MK.
Order from OTS $3.50 PB 161 750-1

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Chap. 1. Introduction
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visual control of aircraft landings
Technical note 5. Implications of accident and pilot reaction time data for AML design
Technical note 6. Determinants of intensity and positioning of approach and runway lighting
(For a condensed version directed to the general non-technical reader see PB 161 750-3)

Human Sciences Research, Inc., Arlington, Va.
AIRPORT MARKING AND LIGHTING SYSTEMS: A SUMMARY OF OPERATIONAL TESTS AND HUMAN FACTORS, by William A. Lybrand, W. S. Vaughan, Jr., and John P. Robinson. Final rept. appendix (with selected annotations and bibliography) on Contract FAA/BRD-13. May 59, 415p. 653 refs. HSR-RR-59/1-MK.
Order from OTS $6.00 PB 161 750-2

This volume contains summaries and references of published reports on airport marking and lighting and related topics. It can be used as a catalog of information about airport marking and lighting to aid airport design engineers and FAA research personnel in identifying and locating reports. (See also PB 161 750-1)

Human Sciences Research, Inc., Arlington, Va.
AIRPORT MARKING AND LIGHTING SYSTEMS; A SUMMARY OF OPERATIONAL TESTS AND HUMAN FACTORS, by William A. Lybrand, W. S. Vaughan, Jr. and John P. Robinson. Condensed rept. on Contract FAA/BRD-13. May 59, 31p. 13 refs. HSR-RR-59/6-MK.
Order from OTS $1.00 PB 161 750-3

This report is a condensed version of HSR-RR-59/1-MK (PB 161 750-1). It is intended for non-technical readers in management or supervisory positions in the aviation industry, and in pertinent government agencies and departments. It describes, within a few minutes reading time, what is known now and what needs to be learned and developed in operational airport marking and lighting.

Flight Control Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
A SUMMARY OF TRIM SYSTEM PROBLEMS, INVESTIGATIONS, CONSIDERATIONS, AND CORRECTIVE ACTIONS, by Richard Hollingsworth. Aug 58, 46p. WADC Technical rept. 58-439; AD-155 802.
Order from LC mi$3.30, ph$7.80 PB 147 580

The various types of trim systems and their operational characteristics are defined. The most significant and recent of the trim system investigations are briefly reviewed. Many aspects of trim system and component design are discussed to illustrate potential problem areas and present possible solutions to problems which are encountered. A brief outline of investigative procedures is presented. Recommendations are given which will assist in achieving the maximum possible degree of safety in trim systems. (Author)

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
ROLE OF STRUCTURAL DAMPING IN ACOUSTICAL FATIGUE, by W. J. Trapp and B. J. Lazan (U. of Minnesota). Rept. on Materials Analysis and Evaluation Techniques and reprint of "Acoustic Fatigue and Damping", presented at 26th Shock and Vibration Symposium, San Diego, Calif., 22 May 58. Jan 60, 31p. 7 refs. WADC Technical rept. 59-304.
Order from OTS $1.00 PB 161 742

Techniques proposed to reduce or eliminate materials fatigue damage due to high level noise fields of propulsion systems and aerodynamically induced pressure fluctuations are discussed. The mechanisms, the significant parameters involved and the response of materials and structures are analyzed. The activities undertaken and notions on the solution of the problem by employing certain damping concepts are presented. (Author)

National Research Labs., Ottawa (Canada).
BRIEF EXPERIMENTS ON A FLAPPED AEROFOIL HAVING A CUSPED CAVITY AND A BLOWING JET AT THE CUSP, by A. D. Wood. Dec 59, 22p. 4 refs. Aeronautical rept. LR-269.
Order from LC mi$2.70, ph$4.80 PB 147 332

Experiments on a simple flapped aerofoil incorporating a cusped cavity and having a blowing jet at the cusp show that it is possible to produce a flow regime in which the cavity is occupied by a stable trapped vortex. With the aerofoil immersed in a quasi-two-dimensional finite stream, greater rotation of the resultant force vector was obtained with a flap of this type than with a flap having no cavity. The results indicate that the combination of a blowing jet and a trapped vortex may be used to advantage in enabling an external flow to overcome an adverse pressure gradient. (Author)

Naval Weapons Lab., Dahlgren, Va.
FEASIBILITY STUDY OF SHAPED CHARGE SEPARATION OF THE AIRCRAFT FLIGHT CAPSULE, by G. W. Baker, M. E. Conlon and others. Final rept. for Aug 59-25 Mar 60. 11 May 60, 70p. NWL rept. no. 1704.
Order from LC mi$3.90, ph$10.80 PB 147 123

In support of the Navy Integrated Flight Capsule study, the feasibility of completely severing service aircraft fuselages, in air and underwater, reliably and with acceptable side effects, was established using prototype flexible linear shaped charge installations. Design, installation and maintenance characteristics are described, component and system tests summarized, system reliability analyzed and factors determining feasibility evaluated. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
FORCED FLEXURAL VIBRATIONS OF SANDWICH PLATES IN PLANE STRAIN, by Yi-Yuan Yu. Technical note no. 4 on Contract AF 49(638)453. July 59, 23p. 7 refs. AFOSR-TN-59-567.
Order from LC mi$2.70, ph$4.80 PB 146 974

On the basis of the new flexural theory of elastic sandwich plates the problem of general forced flexural vibration in the plane-strain case is solved. The results are made use of in solving the problem of a simply supported sandwich plate in plane strain with one of the two end sections prescribed a transverse deflection varying with time.

Princeton U., N. J.
PRELIMINARY FLIGHT EXPERIMENTS WITH THE PRINCETON UNIVERSITY TWENTY-FOOT GROUND EFFECT MACHINE, by W. B. Nixon and T. E. Sweeney. Rept. on Contract DA 44-177-TC-524. Jan 60, 25p. Dept. of Aeronautical Engineering rept. no. 506.
Order from LC mi$2.70, ph$4.80 PB 146 759

This paper deals with measurement of control moments and rates, drawing a comparison with the controllability of a HUP-1 helicopter. Fundamental flow studies are discussed and illustrated by means of diagrams and tuft pictures. Full scale drag measurements are reported and the problem of momentum drag is discussed and shown to be a function of the flow change over the machine's surface produced by the sink. Full scale lift augmentation ratios as a function of the height parameter are presented and compared with those of a 1/12 scale model. The results of hovering performance studies are reported and compared to Chaplin's simple momentum theory. Over-all handling characteristics are discussed and observations of the machine's performance over rough and smooth surfaces and snow are included. (Author)

Rensselaer Polytechnic Inst., Troy, N. Y.
A THEORETICAL EVALUATION OF THE COANDA NOZZLE, by Kuo-Tai Yen. Rept. on Contract AF 18(600)992. 5 July 55, 32p. 7 refs. TR AE5501; [AFOSR-TN-55-253] AD-84 518.
Order from LC mi$3.00, ph$6.30 PB 147 161

An investigation of the Coanda Effect as applied to a two-dimensional nozzle (Coanda Nozzle) with a bend attached to one side of its exit is made in this report. By considering a perfect fluid, theoretical analysis shows that an appreciable mass flow rate increase is obtained when the flow follows the bend and is deflected. Theoretically, the sharper the corner at the bend, the longer the bend attached to the nozzle, and the longer the overhang, the larger the mass flow rate which can be obtained. In particular, the best theoretical result is obtained when the bend is sharp-edged. If the viscous effect of the fluid is considered, the Coanda phenomenon, although theoretically sound, is difficult to put into practical use. Unless effective and positive boundary layer control can be devised and applied, the "Coanda nozzle", in its present form, seems to be limited in its practical value. (Author)

Research, Inc. [Hopkins, Minn.]
INVESTIGATION OF WINDSHIELD RAIN REMOVAL METHODS FOR RE-ENTRY TYPE VEHICLES, by Harry R. Meline and Dennis H. Andersen. Rept. on Contract AF 33(616)5831. Feb 60, 206p. 5 refs. WADC Technical rept. 59-690.
Order from OTS $3.50 PB 161 722

This report contains the results of a study and wind tunnel test program conducted to investigate methods of improving windshield visibility during landing under rain conditions. The investigation was directed towards systems which would be applicable to hypersonic boost-glide vehicles or manned satellites using aerodynamic lift for re-entry speed reduction and landing. Various methods were studied and potential systems were wind tunnel tested under simulated rain conditions to experimentally investigate and demonstrate the effectiveness of the more promising methods. Systems were evaluated on the basis of visibility improvement, weight and space penalty, complexity, and reliability. Data are presented in the form of sketches, curves, and photographs to illustrate the effectiveness of the various systems. The results indicated that several of the methods tested could provide satisfactory improvement of windshield visibility under rain conditions during landing and would be feasible for installation on this type of vehicle. The most desirable systems, however, did exhibit certain inherent limitations and disadvantages. (Author)

Sperry [Phoenix Co., Ariz.]
DEVELOPMENT OF A UNIVERSAL AUTOMATIC FLIGHT CONTROL SYSTEM. Quarterly progress rept. no. 1, Apr-July 58, on Contract DA 36-039-sc-75040. Aug 58, 19p. 2 refs. Rept. no. 3263-3768.
Order from LC mi$2.40, ph$3.30 PB 147 407

A theoretical discussion of the design considerations of the differential required for the helicopter system is presented. Applicable design equations and criteria are developed. (Author)

Sperry Phoenix Co., Ariz.
DEVELOPMENT OF A UNIVERSAL AUTOMATIC FLIGHT CONTROL SYSTEM. Quarterly progress rept. no. 2, 1 July-1 Oct 58, on Contract DA 36-039-sc-75040. Oct 58, 45p. 4 refs. Rept. no. 1260-0001.
Order from LC mi$3.30, ph$7.80 PB 147 408

A theoretical and practical discussion of potentiometer power supplies, and signal demodulator is presented. Schematic diagrams of the components are provided, together with parts data pertinent to reliability analysis. The mathematics and concepts of reliability prediction are explained and applied to significant power supply and demodulator components. Mathematical formulae are presented in exposition of the applied theory. Component failure data from a variety of sources is presented, correlated and evaluated. (Author) (See also PB 147 407)

Sperry Phoenix Co., Ariz.
DEVELOPMENT OF A UNIVERSAL AUTOMATIC FLIGHT CONTROL SYSTEM. Quarterly progress rept. no. 3, 1 Oct 58-1 Jan 59, on Contract DA 36-039-sc-75040. 31 Jan 59, 88p. 2 refs. Rept. no. LJ-1260-0001-3.
Order from LC mi$4.80, ph$13.80 PB 147 409

The RPM control system for helicopters is reviewed in the light of the development of new simplifying concepts and of completion of flight tests of a Sperry RPM Control System developed for the Air Force. The ability to meet the requirements of SCL 1868 with a significantly simplified system is demonstrated. A discussion of signal switching and interlock functions required in the Universal Automatic Flight Control System is presented. (Author) (See also PB 147 408)

Sperry Phoenix Co., Ariz.
DEVELOPMENT OF A UNIVERSAL FLIGHT CONTROL SYSTEM. Quarterly progress rept. no. 4, 1 Jan-31 Mar 59, on Contract DA 36-039-sc-75040. 30 Apr 59, 115p. 3 refs. Rept. no. LJ-1260-0001-4.
Order from LC mi$6.00, ph$18.30 PB 147 410

The results of a computer study of the pitch axis performance of the Universal Automatic Flight Control System (AFCS) and AO-1 aircraft are reported. It is shown that the universal AFCS is capable of stabilizing the pitch atitude of the aircraft well within the requirements of SCL 1870 in the presence of a ten knot step vertical gust. Other subjects investigated in this study include altitude control and the effects of servo dead zone. Analysis of the helicopter RPM System also continued during the past quarter. Controller characteristics are combined with the dynamics of the H-34 helicopter in this report to show the ability of the RPM system to stabilize the helicopter in the case where the rotor is very lightly loaded. (Author) (See also PB 147 409)

Sperry Phoenix Co , Ariz.
DEVELOPMENT OF A UNIVERSAL AUTOMATIC FLIGHT CONTROL SYSTEM. Quarterly progress rept. no. 5, 1 Apr-30 June 59, on Contract DA 36-039-sc-75040. 31 July 59, 50p. 2 refs. Rept. no. LJ-1260-[0001]-5.
Order from LC mi$3.30, ph$7.80 PB 147 411

The installation of the first engineering test model of the Universal Automatic Flight Control System in Sperry's S-55 helicopter is described. General installation requirements are reviewed, and the approach toward meeting these requirements in the S-55 helicopter is discussed. (Author) (See also PB 147 410)

Sperry Phoenix Co., Ariz.
DEVELOPMENT OF A UNIVERSAL AUTOMATIC FLIGHT CONTROL SYSTEM. Quarterly progress rept. no. 6, 1 July-30 Sep 59, on Contract DA 36-039-sc-75040. 31 Oct 59, 101p. 3 refs. Rept. no. LJ-1260-0001-6.
Order from LC mi$5.70, ph$16.80 PB 147 412

The results of a computer study of the Automatic Flight Control System AN/ASW-12(V) controlling the YAO-1 aircraft are reported. The study indicates that the system is capable of satisfying the Signal Corps Technical Requirement 1870 over a range of flight conditions extending from approach speed to maximum indicated air speed at sea-level. Results are reported in terms of the servo system calibration for each axis. The simulation utilizes deliverable servo system calibration for each axis. The simulation utilizes deliverable servo systems (i.e. Electro-Mechanical Rotary Actuators). (Author) (See also PB 147 411)

Ultrasonic Testing and Research Lab.
RESEARCH AND DEVELOPMENT LEADING TO THE ESTABLISHMENT OF ULTRASONIC TEST STANDARDS FOR AIRCRAFT MATERIALS, by G. L. Cross, R. E. Kleint, and R. D. McKown. Rept. for June 58-June 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5877. Feb 60, 147p. 10 refs. WADC Technical rept. 59-466.
Order from OTS $2.75 PB 161 753

The report contains results of a four phase study of materials and techniques concerning the evaluation of internal flaws by ultrasonic means. The four questions studied were: what material variables affect the transmission of ultrasonic compressional waves in certain aircraft materials; what material and geometrical variables affect transmission of shear and surface waves in thin sheet materials; what are the quantities involved when altering the beam diameter by collimation; and, what correlation exists between the ultrasonic and mechanical properties of materials which contain quantities of minute porosity. (Author)

University of Southern California. Engineering Center, Los Angeles.
DESIGN AND TESTS OF AERODYNAMIC STATIC PRESSURE COMPENSATORS FOR FOUR SERVICE AIRCRAFT, by Frederick O. Smetana. Rept. on Contract AF 33(600)36143. May 59, 43p. WADC Technical rept. 59-383; AD-233 999.
Order from LC mi$3.30, ph$7.80 PB 147 872

Aerodynamic static pressure compensators, the necessary shortened nose booms, pitot-static tubes, and Mach switches have been developed for four types of service aircraft. These devices permit the sensing of free stream pressure to within .015 q_c for $M<1.0$ and .01 P for $M>1.0$ with nose booms 1/3 to 1/2 as long as existing production systems. Further work is reported which indicates that the resultant error for $M<1.0$ can be reduced to $0.006q_c$ or less. (Author)

Vertol Aircraft Corp., Morton, Pa.
DEVELOPMENT OF IMPROVED CARGO SLING SYSTEM INCORPORATING LOAD STABILIZATION. ENGINEERING ANALYSIS. Final rept., phase 1, on Contract DA 44-177-TC-587. Mar 60, 78p. 1 ref. R-186.
Order from LC mi$4.50, ph$12.30 PB 146 903

Design and analytical studies were performed to determine optimum configurations of equipment to be used with Army cargo helicopters to improve their capabilities in airlifting standardized Army loads externally. Devices investigated covered all feasible concepts (1) for improving the effective pivot point of the load with respect to the helicopter center of gravity, and (2) for reducing to a minimum the motions of the load with respect to the fuselage. Specific configurations are recommended. (Author)

Winzen Research, Inc., Minneapolis, Minn.
MANHIGH II. USAF MANNED BALLOON FLIGHT INTO THE STRATOSPHERE FLOWN BY DAVID G. SIMONS. Final rept. on Contract AF 29(600)808. June 59, 355p. 49 refs. AFMDC-TR-59-28; AD-230 805.
Order from LC mi$11.10, ph$84.90 PB 146 511

Project MANHIGH II was undertaken to investigate the human factors of space flight. The project sought to (1) discover how man reacts in this hostile environment, (2) learn more of the design principles for space capsules, and (3) how to study man's reactions to permit intelligent planning of future space flight experiments. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
COLD GAS ATOMIZATION OF LOW VOLATILITY LIQUIDS, by Malcolm G. Gordon. Jan 60, 30p. 8 refs. CWLR-2333; AD-231 235.
Order from LC mi$2.70, ph$4.80 PB 146 859

Bis(2-ethylhexyl)hydrogen phosphite was atomized by compressed air using a device similar in design to a multicompartment thermal generator and equipped with various nozzle configurations. Several different sampling techniques were used as a means of characterizing the aerosol produced. The data obtained were compared to the Nukiyama-Tanasawa equation characterizing the process, and the application of the cold gas technique to a practical munition device was considered.

Army Chemical Warfare Labs., Army Chemical Center, Md.
PROTECTOR, COLLECTIVE, EMD, 75 CFM, E36; FILTER, PARTICULATE, 75 CFM, E37; AND FILTER, GAS 75 CFM, E36R1 (FINAL ENGINEERING TESTS NOS. 115, 134, AND 135) by Paul E. Oliver, James W. Waddey, Jr. and Irving S. Sherman. Jan 60, 49p. CWLR-2335; AD-231 790.
Order from LC mi$3.30, ph$7.80 PB 146 861

Final engineering tests of the E36 75-cfm collective protector, and its component E37 particulate and E36R1 gas filter units, designed to provide protection for AACS shelters during CBR attacks, and to heat and/or ventilate the shelters during normal operation are presented. The test program showed that the prototype unit and its components fulfilled the design characteristics under which it was developed. (Author)

Army Chemical Warfare Labs., Army Chemical Center, Md.
THERMAL ATTENUATION BY CHEMICAL SMOKES, by Jerry J. Mahoney, Douglas D. Keough and David T. Kilminster. Rept. for Apr-June 55 on Thermal Radiation Attenuating Cloud Study. Jan 60, 28p. 12 refs. CWLR 2353.
Order from LC mi$2.70, ph$4.80 PB 147 550

The transmissivity of thermal radiation from a carbon arc through six different smokes was measured at concentrations of from 0 to 5 g/sq m. The smokes were tested to evaluate their capabilities to attenuate thermal radiation from nuclear detonations. (Author)

Battelle Memorial Inst., Columbus, Ohio.
DEVELOPMENT OF THE ZONE-PURIFICATION PROCESS FOR PREPARING POTABLE WATER FROM SEA WATER, by W. H. Mink, G. F. Sachsel, and R. B. Filbert, Jr. Rept. for 16 June 59-31 Mar 60 on Contract No. 14-01-001-175. 1 June 60, 36p. 2 refs. Saline Water Research and Development Progress rept. no. 39.
Order from OTS $1.00 PB 161 766

As a first step toward obtaining the optimum economic zone-freezing process, the vertical-tube unit was simulated on an analog computer to determine the effect of design parameters on product salinity. With this information plus some additional experimental freezing data, it was possible to show that the optimum vertical-tube unit would require four stages, would freeze 13 per cent of the feed before discharging it, and would require that the temperature difference in the freezing zones be 3 F. Based on these results, it was possible to estimate that the total plant investment for a plant producing 100,000 gallons of potable water per day would be about $2,600,000. The estimated operating cost for a plant this size was found to be about $9.60 per 1,000 gallons of potable water. For a plant designed to produce 10 million gallons of potable water per day, the total plant investment and the daily operating cost were estimated at about $115,000,000 and $4.20 per 1,000 gallons, respectively. It is unlikely that these costs could be reduced further even with major changes in the process.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
PRESS-FIT CLOSURES FOR 8-INCH T174 CHEMICAL SHELL, by Walter J. Puzia. Mar 60, 24p. Technical rept. 2678.
Order from LC mi$2.70, ph$4.80 PB 145 243

This report presents the results of a study to establish the optimum burster casing wall thickness at the press-fit for the 8-inch T174 chemical shell. Since it is known that leakage of the shell filler is usually associated with "galling," or abrasion, of the press-fit surfaces, it is the objective of this study to determine the burster casing wall thickness which produces the least amount of galling of the press-fit surfaces when assembled. As this study does not cover variations in degree of interference, surface finishes, or entrance radii, these were kept as nearly constant as possible and representative of established practice for shell press-fits. Only the wall thickness was varied. Rate of pressing the parts together and lubrication of surfaces were also representative of actual practice. Traces were made of assembling load versus travel, using electrical strain gage equipment, to determine smoothness of assembling and magnitude of assembling load. The assemblies were then sectioned longitudinally, and the press-fit surfaces were photographed to note the degree of abrasion. (Author)

Naval Research Lab., Washington, D. C.
THE PRESENT STATUS OF CHEMICAL RESEARCH IN ATMOSPHERE PURIFICATION AND CONTROL ON NUCLEAR-POWERED SUBMARINES, by R. R. Miller and V. R. Piatt. Interim rept. 21 Apr 60, 167p. 232 refs. NRL rept. 5465.
Order from OTS $3.00 PB 161 518

A comprehensive report has been written on the past and present research and development effort of the U.S. Naval Research Laboratory on the atmospheric habitability of submarines. Topics covered include atmospheric sampling, analysis and monitoring, the generation of oxygen, and the removal of unwanted components such as carbon monoxide, carbon dioxide,

hydrogen, organic contaminants, and aerosols. Emphasis is given to methods of preventing the gradual buildup of contaminants capable of decreasing the efficiency of the crew or of having deleterious effects on delicate or critical equipment. Future research must emphasize increasing reliability, complete independence of an external supply of oxygen, and more attention to the evolution of an integrated and automatically controlled system. (Author)

Naval Supply Research and Development Facility, Bayonne, N. J.
ULTRASONIC CLEANING, by S. Cholmar and S. Stambler. 20 Nov 58, 67p. 35 refs. Proj. NT003017(j) Engineering rept. no. 2.5064.
Order from LC mi$3.90, ph$10.80 PB 147 146

The technical and economic factors involved in the use of ultrasonic cleaning methods were determined. Ultra sonic cleaning is applicable to the cleaning of small, critical parts and is economical when the savings in labor, solvent costs and the increase in efficiency offset the cost of the ultrasonic cleaning equipment. Criteria developed for the use of ultrasonic cleaning methods can be used by interested activities as a guide in determining the applicability of ultrasonic techniques to their cleaning operations. (Author)

Texas A. and M. Research Foundation, College Station.
DEVELOPMENT OF THE SOLVENT DEMINERALIZATION OF SALINE WATER. Rept. on Contracts 14-01-001-77 and 14-01-001-106. Feb 60, 93p. 1 ref. Saline Water Research and Development Progress rept. no. 35.
Order from OTS $2.25 PB 161 769

Solubility and equilibrium data are presented for a variety of solvents of which secondary and tertiary amines appear to have many desirable properties. Use of radioactive sodium and chloride in the equilibrium determinations indicate that for amines the ions do not distribute equally between the phases because of the hydrolysis of these solvents in water. Operational data for the laboratory model of the extraction process are reported. The results were as predicted from the equilibrium and solubility data for the solvents employed, and no unusual operating conditions were encountered. A cost equation is developed to allow rapid evaluation of the results produced by different solvents and by various operating conditions. This equation is used to calculate the cost of two solvents under various conditions. (Author)

Westinghouse Research Labs., Pittsburgh, Pa.
TRAPPING OF NOBLE GAS IONS AND THE REEMISSION OF THE TRAPPED ATOMS FROM NICKEL AND MOLYBDENUM, by J. H. Carmichael and J. S. Knoll. [Rept. on Contract AF 18(600)1049] 25 Sep 58, 16p. 4 refs. Scientific paper 6-94439-9-pl; AFOSR-TN-58-971; AD-205 601.
Order from LC mi$2.40, ph$3.30 PB 138 058

The electrical cleanup of noble gases on nickel and molybdenum surfaces has been investigated. The reemission of the trapped atoms has been measured and is shown to be an important factor in the observed saturation of the cleanup process. Pumping speeds and re-emission rates for helium, neon, argon, and krypton have been measured and compared with the phenomenological theory (J. Appl. Phys. 28, 913 (1957)) which had previously been proposed to explain the contribution of re-emission to the pumping process of helium on molybdenum surfaces. (Author)

Civil Engineering

Beach Erosion Board, Corps of Engineers, Washington, D. C.
ANNUAL BULLETIN. VOL. 13. July 59. 60p. 5 refs.
Order from LC mi$3.60, ph$9.30 PB 147 492

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Michigan U. [Research Inst.] Ann Arbor.
STRUCTURAL INSTABILITY UNDER TIME-DEPENDENT LOADS, by E. F. Masur. Final rept. on Contract DA 20-018-ORD-14027. June 58, 51p. 10 refs. OOR rept. 1591. 1-E; AD-161 938.
Order from LC mi$3.60, ph$9.30 PB 146 798

Possible definitions of time-dependent stability are discussed. The response of simply supported columns to linearly attenuating lateral and axial forces is computed and charted for a broad variety of parameters, including asymptotic cases. The equations governing columns of other boundary conditions are developed and their solution is indicated. Special sections are devoted to multi-story frames and arches. (Author)

Naval Civil Engineering Lab., Port Hueneme, Calif.
PASSIVE RESISTANCE OF EARTH-ANCHORS IN SAND, PART. II, by J. E. Smith. Interim rept. 8 Mar 60, 55p. 3 refs. Technical rept. 073.
Order from LC mi$3.60, ph$9.30 PB 147 118

Various size prototype earth-anchors are being tested singly and in rectilinear groups at different depths behind trapezoidal and triangular shaped berms of different sizes, in order to improve designs using earth-anchors for lateral support. This report outlines the earth-anchor test program, Part 2, describes the methods, equipment and apparatus employed, and gives the results of tests conducted to date. The test program is about 15% completed. (Author)

Aeronutronic [Newport Beach] Calif.
TELEMETRY SYSTEM STUDY, VOLUME I (of I) by C. Harrison Smith, J. W. Capps and others. Semi-annual rept. for 6 Feb-30 Nov 58, on Contract DA 36-039-sc-73182. 31 Dec 58, 112p. 14 refs. ASI Publication no. U-320; AD-213 319.
Order from LC mi$6.00, ph$18.30 PB 147 629

The objectives of the program are: (1) to forecast the individual flight requirements for telemetry at the test ranges in the next decade and the effect of heavy traffic on multiple range operations; (2) to recommend suitable operating frequencies for further telemetry systems; (3) to examine various modulation or coding methods and recommend an optimum technique for future systems; (4) to investigate the performance of present systems and recommend improvements. Experimental telemetry system test setups for a number of modulation systems are presented. A summary of telemetry interference measurements made in the 225-260 mc/s, 1435-1535 mc/s and the 2200-2300 mc/s frequency bands aboard the USS GALVESTON December 2 - 6, 1958 is given, and the results of a transmitter frequency stability study to determine feasibility of .001% operational stability in near-future applications for the 2200-2300 mc/s frequency band is reported.

Air Force Cambridge Research Center, Bedford, Mass.
AN EVALUATION OF THE P-N-P-N NEGATIVE RESISTANCE DIODE, by H. I. Honor. Master's thesis. Mar 59, 39p. 10 refs. AFCRC-TR-59-140; AD-230 945.
Order from LC mi$3.00, ph$6.30 PB 146 446

The operation of the three junction diode is analyzed and interpreted in terms of two contiguous transistors. It is seen that avalanche breakdown and the sum of the forward alphas determine the switching characteristics. The properties of four varieties of the diode are presented and comparisons made. A piecewise-linear equivalent circuit is developed. Some simple circuit applications are analyzed. (Author)

Air Force Cambridge Research Center, Bedford, Mass.
SPHERICAL GRIDS FOR ELECTRON TUBES, by George P. Ploetz. Feb 60, 12p. AFCRC-TN-60-160.
Order from LC mi$2.40, ph$3.30 PB 147 508

Hemispheric shaped grids for spherical electron tubes are described. A number of design variations are given. From these basic considerations many special grid designs can be readily visualized and made. (Author)

Antenna Lab., Ohio State U. Research Foundation, Columbus.
CALCULATED VALUES OF SELF AND MUTUAL IMPEDANCES FOR PARALLEL SHORT DIPOLES, by Frank Serracchioli. Rept. on Antenna Phenomena Research, Contract DA 36-039-sc-70174. 24 Mar 59, 84p. 8 refs. Rept. no. 662-23; AD-220 546.
Order from LC mi$4.80, ph$13.80 PB 146 938

Research concerns a study of surface waves supported by Yagi arrays. A large number of self and mutual impedances for center-fed dipoles were calculated by means of an IBM 650-653 B4 digital electronic computer. Although the values obtained do not form a uniform table, i.e., a table in which the parameters vary by constant steps, the information made available by this large number of impedances may be useful whenever a zeroth order approximation is sufficient; hence the values were tabulated in such a way as to make table look-up and interpolation as easy as possible. The formulae used for the calculations are reported and their approximations discussed. Details on the mathematical devices adopted for computer programming are explained. The tabulated results were compared with values given by more advanced theories and with experimental measurements, and a simple correction formula is deduced therefrom. The computer flow chart and the complete machine program, with a brief explanation of the, are included in the appendix. (Author)

Antenna Lab., Ohio State U. Research Foundation, Columbus.
AN EXPERIMENTAL INVESTIGATION OF THE RADIATION PATTERNS OF ELECTROMAGNETIC HORN ANTENNAS, by Donald R. Rhodes. Rept. on Contract W33-038-ac-16520. 22 Sep 47, 26p. 7 refs. Rept. 301-3; ATI 33 451.
Order from LC mi$2.70, ph$4.80 PB 147 126

A fund of radiation pattern design data on electromagnetic horns is provided for applications requiring patterns which have special characteristic shapes. Electromagnetic horn patterns for horns having flare angles up to 50° and horn lengths up to 50 wavelengths are included. Klystron and magnetron oscillators are used for sources of radiation. Consideration is given to frequency limitations which must be placed upon the throat aperture dimensions. References and applications are made to wave guides.

Antenna Lab., Ohio State U. Research Foundation, Columbus.
IMPEDANCE CHARACTERISTICS OF A UNIFORM CURRENT LOOP HAVING A SPHERICAL CORE, by Saburo Adachi. Rept. on Antenna Phenomena Research, Contract DA 36-039-sc-70174. 15 Apr 59, 18p. 4 refs. Rept. 662-26; AD-220 386.
Order from LC mi$2.40, ph$3.30 PB 146 939

The impedance characteristics of a uniform current loop with a spherical core of an arbitrary composition of μ and ϵ were theoretically investigated. The radiation impedance is derived by the emf method in a convenient form as the sum of the self-radiation impedance of an air loop and an additional term due to the reaction between the loop and the sphere which is proportional to the well-known expansion coefficient of a magnetic-type scattered wave from a sphere in an incident plane wave. The first antiresonance frequency was given in the form of a universal curve for a very small uniform current loop with a core of an arbitrary

composition of μ_s and ϵ_s, subject to the condition that the refraction coefficient $N = \sqrt{\mu_s \epsilon_s}$ is extremely large. It should be noted that the above results can be directly applied to the first magnetic-type resonance frequency of a sphere in an incident plane wave. To show quantitative impedance characteristics of a loop with an arbitrary composite core, the radiation impedances for 2 cases, namely $\epsilon_s = 100$, $\mu_s = 1$, and $\mu_s = 100$, $\epsilon_s = 1$, were calculated and compared with an air loop. It is concluded that high-μ core is desirable for a comparatively lower frequency region, and high-ϵ core is rather desirable in an antiresonance frequency region. (Author)

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A MODIFIED HELICAL ANTENNA, by T. S. M. Maclean. Rept. on Antenna Phenomena Research, Contract DA 36-039-sc-70174. 15 Apr 59, 15p. 3 refs. Rept. 662-28; AD-226 742.
Order from LC mi$2.40, ph$3.30 PB 146 940

A study of the modulated helical antenna was begun with the object of applying linear array theory to its operation. It is well known that the optimum pattern which can be obtained from such an array is produced by a Tchebyscheff source distribution along its axis. When applied to a singly fed end-fire array like the helical antenna this entails several aspects which must be considered: (1) the amplitude distribution is no longer uniform, (2) the phase shift between successive elements is greater than that required for satisfying the Hansen-Woodyard condition, and (3) the radiation from turns connecting the adjacent elements has to be superimposed on the Tchebyscheff pattern. A study of the effect of these modifications to the theory of the uniform helix was made, and it is shown that they considerably restrict the possibility of obtaining increased directivity. An incidental outcome of the study, however, is that it is comparatively easy to obtain a pattern with reduced sidelobe level. (Author)

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF HIGH ALTITUDE WAVEGUIDES, by Henry Zucker, Charles M. Knop, and Kurt Gutfreund. Rept. on Thermonic and Solid State Electronic Technology, Contract AF 33(600)32202. Feb 60, 115p. 9 refs. WADC Technical rept. 59-741.
Order from OTS $2.50 PB 161 725

The objective was the development of C, X, and Ku band rectangular waveguide components capable of operating at high power levels, at temperatures from -65°C to 250°C, and at altitudes up to 80,000 feet without the use of auxiliary pressurization equipment. The methods investigated to attain this objective were: waveguides completely filled with dielectric, waveguides sealed by means of tapers (continuous and stepped), and waveguides sealed by dielectric windows. The analysis of waveguides completley filled with dielectric indicates that this technique is not suitable because of the excessive attenuation encountered with presently known dielectric materials. Design techniques for broadband dielectric tapers, both continuous and stepped, and for dielectric windows are established, and the experimental data indicates good correlation with the predicted performance. Dielectric windows using glass-reinforced Teflon laminates were selected for the final waveguide components because of the compact nature of this sealing technique. For frequencies above Ku band, the dielectric taper seals are recommended. (Author)

Armour Research Foundation, Chicago, Ill.
IRRADIATION TESTING OF OPERATING ELECTRONIC EQUIPMENT BY FAST NEUTRONS AND GAMMAS, by R. J. Arndt and C. W. Terrell. Final rept. on Contract N62269-253. 30 Apr 58, 41p.
Order from LC mi$3.30, ph$7.80 PB 147 371

The work reported herein consists of a study of the radiation effects of fast neutrons (0.5 ev to about 15 mev) and gamma rays (fission spectrum) on various pieces of aircraft instrumentation. Components studied were: (1) Fuel Gage Vacuum-tube Amplifier and Indicator, (2) Transistorized (germanium and silicon) Servo Amplifier System, (3) 4 inch Diameter Gyro. The Fuel Gage was subjected to a total neutron flux of about 6×10^5 nvt and about 5×10^8R gamma with no adverse electrical effect. Physical damage was evident. Four Transistorized Amplifiers were irradiated in a fast flux of about 1.0×10^{10} n/cm^2/sec. Rapid loss in gain, rapid increase in d.c. current drain, and complete failure occurred when the integrated flux reached about 10^{13} n/cm^2. The silicon diodes were unaffected by the same flux. Studies on the gyro were inconclusive due to equipment failure. (Author)

Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.
NOISE REDUCTION THROUGH ELASTIC PULSE MODULATION, by Erich Pieruschka. 1 July 58, 29p. 9 refs. Rept. no. 2R29F; AD-205 574.
Order from LC mi$2.70, ph$4.80 PB 147 463

The noise reduction in a new type of transmission system, elastic pulse modulation, is investigated analytically in this study. The signal-to-noise ratio of this system is compared with that of pulse position modulation, the system from which it is derived. The analysis is made both for a single link transmission system and for one in which successive regenerative repeaters are applied. The noise reduction for the case where the position of the pulse in a staircase waveform is transmitted by a binary pulse code group is also investigated. This investigation is then expanded to include the case of a system employing a chain of regenerative repeaters. (Author).

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
SPECTRUM UTILIZATION OF DORSETT TR-12, RADIATION 3021A26, RADIATION A-3115-2A, TELECHROME 1472A2, FM/FM TELEMETRY TRANSMITTERS, by William E. Castilo, Virgilio Cisneros, and Charles R. Wise. 9 Dec 59, 107p. AFC Rept. no. TM-9-12-59-T; AD-233 395L.
Order from LC mi$5.70, ph$16.80 PB 146 835

The operational characteristics of these four telemetry transmitters were tested to determine the frequency allocation necessary for operation with a

minimum of interference. The tests were run by subjecting the units to parameters of supply voltage variation, operating time, simulated altitude, acceleration and vibration, while empirical measurements were made of their frequency stability, modulation sensitivity and power output. In addition interference characteristics (spurious emissions), VSWR and residual FM were tested.

Army Signal Research and Development Lab., Fort Monmouth, N. J.
ARC SUPPRESSION FOR RELAY CONTACTS, by Ronald Green and Arthur P. Boylan. 15 Aug 59, 17p. 9 refs. USASRDL Technical rept. 2061; AD-227 716.
Order from LC mi$2.40, ph$3.30 PB 146 934

Various methods of arc suppression for relay contacts are investigated, including RC networks and utilization of semi-conductors. Theoretical considerations are presented and the effects of relay characteristics on the suppression parameters discussed. Results of laboratory experiments, comparing theoretical circuit constants with actual values required for optimum suppression, are reported. Empirical formulae are presented for selection of RC networks and guidelines established for application of semiconductor suppression techniques. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
TESTING FOR CORONA IN COAXIAL CABLES, by John P. Agrios. 1 Mar 60, 11p. 3 refs. USASRDL Technical rept. 2100.
Order from LC mi$2.40, ph$3.30 PB 146 936

This report supplements the information for corona testing of coaxial cables for Specification MIL-C-17C. The test circuitry and the calibration of the equipment are discussed to serve as a guide to cable manufacturers for such testing. The cable specimen preparation is also discussed to ensure corona free cable specimens. A brief discussion of the discharges within coaxial cables under high voltage stress is included. (Author)

Army Signal Research and Development Lab., Fort Monmouth, N. J.
VOLTAGE SENSITIVE DIODE TUNING SYSTEMS, by Richard S. Tilton and Louis V. Bessen. 15 Apr 59, 26p. 1 ref. USASRDL Technical rept. 2045; AD-220 338.
Order from LC mi$2.70, ph$4.80 PB 146 933

Voltage-sensitive variable-capacitance semi-conductor diodes were investigated for use in tuning systems. Variation of C and Q with voltage and temperature in the 10-80 mc frequency range are reported. Circuits for obtaining straight-line-frequency tuning, tracking of ganged diodes, and temperature compensation are described. (Author)

Arnold Engineering Development Center, Tullahoma, Tenn.
A TRANSISTORIZED GALVANOMETER CURRENT LIMITER, by P. L. Clemens and R. L. Ledford. Rept. on ARO, Inc. Contract AF 40(600)800. Nov 59, 19p. 3 refs. AEDC-TN-59-110; AD-229 206.
Order from LC mi$2.40, ph$3.30 PB 146 763

Design, operating characteristics, and typical applications of a newly developed, transistorized, galvanometer current limiter are described. The limiter, which provides continuously variable adjustment of maximum permissible galvanometer current, has but small effect on other characteristics of the instrumentation system within which it is used (i.e., accuracy, linearity, and frequency response). Use of this galvanometer current limiter permits a decrease of system scale factor, resulting in greater resolution of diminutive data areas, while preventing destructively large galvanometer currents or deflections which might result from occasional extremes of value of the measured parameter. Although intended for use with oscillograph galvanometers, the current limiter is also applicable to other galvanometers and to meter movements as well. (Author)

Bell Telephone Labs., Inc. [New York]
ENGINEERING SERVICES ON TRANSISTORS, by H. G. Follingstad, J. H. Forster and others. Interim technical rept. no. 8, 16 Dec 56-15 Mar 57, on Contract DA 36-039-sc-64618. [1957] 46p. 3 refs. AD-133 294.
Order from LC mi$3.30, ph$7.80 PB 147 386

Contents:
Task 2. Transistor reliability
Task 4. New and improved transmission-type transistors
Task 5. Transistor test methods

Bulova Research and Development Labs., Inc., Woodside, N. Y.
AUTOMATIC MACHINE FOR SEALING OF QUARTZ CRYSTAL UNITS, by Robert J. Bibbero and R. Giglio Tos. Quarterly progress rept. no. 1, 24 June-24 Sep 57, on Contract DA 36-039-sc-72775. [1957] 19p.
Order from LC mi$2.40, ph$3.30 PB 137 444

The purpose of this contract is to develop the prototype of an automatic projection-welding sealing machine for quartz crystal holders HC-6/U, -13/U, and -18/U. This report outlines the general concept of the machine and the design of holders for projection-welding.

Bulova Research and Development Labs., Inc., Woodside, N. Y.
AUTOMATIC MACHINE FOR SEALING OF QUARTZ CRYSTAL UNITS, by Robert J. Bibbero and R. Giglio Tos. Quarterly progress rept. no. 3, 25 Dec 57-24 Mar 58, on Contract DA 36-039-sc-72775. [1958] 15p.
Order from LC mi$2.40, ph$3.30 PB 137 442

Samples of special crystal holders for projection welding, of a size meeting HC-6/U specifications, were manufactured. Crystal holder loading racks (used for evacuation and handling during welding) have been designed and fabricated. (See also PB 137 443)

Bulova [Research and Development Labs., Inc.] Woodside, N. Y.
INDUSTRIAL PREPAREDNESS MEASURE ON TIGHTER TOLERANCE CRYSTAL UNITS CR-(XM-9)/U, by A. S. Matistic. Quarterly rept. no. 1, July 57-Apr 58 on Contract DA 36-039-sc-75940. [1958] 56p. 4 refs.
Order from LC mi$3.60, ph$9.30 PB 137 439

Quartz Crystal processing: Determination and Selection of a Suitable Wafer Cutting Method, Double Crystal X-Ray Set-Up Determination of Z-Z' Orientation Limits over the frequency range from 50MC to 100MC, and, Selection and Determination of Suitable Lapping Procedures.

Burroughs Corp., Paoli, Pa.
REMOTE ELECTRONIC ALPHANUMERIC DISPLAY, by P. J. Barnes, R. E. Benn and others. Final rept. on Contract AF 19(604)3870. 28 Feb 59, 130p. TR-59-9; AFCRC-TR-59-231; AD-213 237.
Order from LC mi$6.30, ph$19.80 PB 146 039

The Remote Electronic Alphanumeric Display (READ) is intended to display local airfield observations sent from the Weather Information Telemeter Station, at such locations as control towers, ready rooms, GCA units, operations office, and weather office. The device receives either 5 or 6 level serial teletype code and electrostatically prints incoming messages at the rates of 1000 or 2000 words per minute. The character size is 5/8 inch high x 3/8 inch wide allowing a 72 character message to be legible from a distance up to 12 feet under both night and daylight conditions.

Chatham Electronics, Livingston, N. J.
DEVELOPMENT AND EVALUATION OF ELECTRON TUBE GLASSES RESISTANT TO RADIATION DAMAGE, by G. R. Weinberg. Semi-annual progress rept. no. 1 for 1 May-1 Nov 59 on Contract DA 36-039-sc-78312; Continuation of Contract DA 36-039-sc-75065. [1960] 22p.
Order from LC mi$2.70, ph$4.80 PB 146 943

Dummy bulbs, with and without leads, made of Owens-Illinois 51-26 boron-free glass, of 3% B_2O_3 and 6% B_2O_3 glass and Corning 7052 and 1723 glass were exposed to neutron bombardment of integrated thermal flux of 10^{16} NVT. Some of these enclosures were checked for strain before and after exposure and others were analyzed for gas content after exposure. A few tubes of type 5U4G and 5R4WGA with special envelopes and a few ionization gauge tubes of type VG1A were irradiated along with Cadmium-Aluminum activation foils as dosimeters. Analysis of these foils revealed an apparent discrepancy in integrated dose, amounting to about ten times the assumed dose, thereby casting some doubt on prior quantitative results in this and the previous contract. (Author) (See also PB 146 041)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
STUDY OF METHODS OF COOLING SEMICONDUCTOR DEVICES, by Steven K. Morrison and James P. Welsh. Final rept. on Contract AF 30(602)1842. Mar 60, 41p. 230 refs. Rept. no. HM-1247-D-4; RADC-TR-60-23.
Order from LC mi$3.30, ph$7.80 PB 146 874

The following techniques pertinent to cooling of semiconductor devices were investigated: methods of mounting, electrically insulating, and removing the dissipated heat by conduction through metals; methods of mounting, fin areas, configurations and orientation to enhance heat removal by natural convection; methods of mounting, geometry, fin configurations, air velocities, air flow rates, and other parameters pertinent to forced convection; and direct and indirect liquid cooling techniques.

Cruft Lab., Harvard U., Cambridge, Mass.
DIPOLE ANTENNAS COUPLED ELECTRICALLY TO A FOUR-WIRE TRANSMISSION LINE TO ACHIEVE CIRCULARLY POLARIZED RADIATION (THEORETICAL AND EXPERIMENTAL STUDIES) by Kun-Mu Chen. Scientific rept. no. 3, series 2 on Contract AF 19(604)4118. 15 Sep 59, 48p. 4 refs. AFCRC-TN-60-127; AD-232 517.
Order from LC mi$3.30, ph$7.80 PB 146 084

Dipole antennas coupled electrically and in a balanced manner to a four-wire transmission line so as to maintain circularly polarized radiation are studied theoretically and experimentally. The configuration consists of a pair of two-wire transmission lines located on the diagonals of a square and driven 90° out of phase. To the lines are coupled many sets of four-dipole antennas arranged symmetrically in planes perpendicular to the transmission lines. If the sets of four-dipoles are separated by a distance of a half wavelength along the transmission line, a circularly polarized radiation with a bilateral end-fire pattern is obtained. By coupling at intervals of a quarter wavelength to the line with a traveling wave, a unidirectional end-fire array may be achieved in the direction along the transmission line. The current, the optimum length of the antenna, the general nature of the coupling, the coupling between additional sets, and the radiation field factor are studied. (Author)

Cruft Lab., Harvard U., Cambridge, Mass.
EXPERIMENTAL DETERMINATION OF THE ZERO-CROSSING DISTRIBUTION W(N,T) by Gerald M. White. Technical rept. on Contract Nonr-1866(16). 15 June 57, 33p. Technical rept. no. 265; AD-146 013.
Order from LC mi$3.00, ph$6.30 PB 147 135

A description is given of the additional equipment built to continue the study of zeros of noise (AD-135 934), and the additional data obtained are depicted by graphs. Broadband noise, narrow-band noise and intermediate cases were considered. The experimental curves agree with calculated curves, and the values of W(N,T), the probability of having N zero-crossings in a time interval T, agree with theoretical predictions.

David Sarnoff Research Center, Princeton, N. J.
FEASIBILITY STUDY OF COMPATIBLE SINGLE SIDE BAND TRANSMITTER, by K. H. Powers, C. A. Von Urff, and F. I. Zonis. Final rept. on

Contract AF 19(604)4976. 30 Nov 59, 106p. 6 refs. AFCRC-TR-60-103.
Order from LC mi$5.70, ph$16.80 PB 146 083

A new method of generation of a Single Sideband signal has been developed which provides distortionless reception with a square law envelope detector. This unique compatibility is achieved through a new system design rather than a method such as carrier reinsertion. The system has been completely implemented and many tests made. It has been possible to obtain an average of 25 db sideband rejection using band limited while noise as the intelligence; an average of 2% harmonic distortion using single tone as the intelligence with square law detection and an average of 8-10% intermodulation distortion under the same conditions. In particular applications 25-30 db of sideband rejection may not be sufficient. It is possible to pass the signal through a single sideband filter to increase the rejection and at the same time not materially increase the harmonic and intermodulation distortion.

Diamond Ordnance Fuze Labs., Washington, D. C.
A GUIDE TO SELECTION AND USE OF DYNAMIC PRESSURE TRANSDUCERS, by Arthur Hausner. 14 Sep 59, 17p. 8 refs. Technical rept. TR-814; AD-233 007.
Order from LC mi$2.40, ph$3.30 PB 146 137

A survey was made of commercially available dynamic pressure transducers. The more important characteristics of these transducers taken from the manufacturers' literature are grouped according to principle of operation. For each group listed, the names and addresses of representative manufacturers of the transducers are given. Users of dynamic pressure transducers will find the information useful for selecting one which will best serve for a particular measurement. (Author)

Directorate of Flight and All-Weather Testing, Wright-Patterson AFB, Ohio.
MODIFICATION OF NDRC TELEMETERING EQUIPMENT, by Robert L. Goff. Rept. by Radiation, Inc., on Contract AF 33(038)22817. June 54, 28p. Technical note WCT-54-36.
Order from LC mi$2.70, ph$4.80 PB 147 582

This modification program resulted in greatly improved functional characteristics and excellent packaging. Radio link signal levels lower than 20 microvolts allow radio interference to be superimposed upon the recorded signal so that information at frequencies greater than 10 cycles is difficult to measure accurately. Tests were conducted to determine system stability. Linearity characteristics of the system chain from transducer to recorder were better than one per cent under ideal video link conditions.

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
DETECTION AND MEASUREMENT OF SPURIOUS SIGNALS GENERATED BY MICROWAVE OSCILLATOR TUBES, by R. E. Booth and R. G. Veltrop. Rept on Contract DA 36-039-sc-73170. 9 Jan 58, 25p. 1 ref. Technical memo. no. EDL-M72; AD-158 646.
Order from LC mi$2.70, ph$4.80 PB 147 132

Two methods of detecting and measuring spurious signals generated by microwave oscillator tubes are given in this report. The first is a point-by-point technique which employs a manually tuned receiver to examine the output of the tube under test. The second is the search receiver technique which uses the tube under test as the swept local oscillator of a receiver. In the latter case, a simulated signal is supplied to the receiver to provide mixing with the spurious signals, if any. Step-by-step procedures are given and the problem of distinguishing between true spurious signals and signals produced by receiver phenomena are discussed. The origin of spurious signals near the main frequency is also discussed and experimental comparison is made with theory. (Author)

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
MICROWAVE PHASE SHIFTING BY FERROELECTRIC ELEMENTS, by Howard Diamond. Rept. on Contract DA 36-039-sc-73170. 25 Apr 58, 20p. Technical memo. no. EDL-M134. AD-203 549.
Order from LC mi$2.40, ph$3.30 PB 146 059

Phase shifts have been measured for typical commercial non-linear ceramics placed in a terminating position on a coaxial transmission line. An appendix covering several definitions of ferroelectric properties is included.

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE APPROXIMATION OF NETWORK FUNCTIONS USING TCHEBYCHEFF POLYNOMIALS, by Shlomo Karni. Technical note no. 12 on Contract AF 49(638)63. 18 Mar 60, 66p. 31 refs. AFOSR-TN-60-342.
Order from LC mi$3.90, ph$10.80 PB 146 920

Approximation is accomplished by expanding the prescribed response function and an assumed network response function in series of Tchebycheff polynomials. Matching a finite number of terms in the two series determines the desired network function, and the error of approximation. The results represent an extension of a method due to Darlington. The extensions include a method for the derivation of Padé approximants from the Tchebycheff polynomials series expansion of the prescribed gain, a procedure for the reduction of network complexity, and a technique for the matching of the power series expansions of the derivative of a prescribed gain function with that of a network function. The theoretical developments are supported by step-by-step procedures for use in design problems. Included are realizability tests, various tabulations, and graphs. The methods are illustrated by the following examples. (1) The equalization of gain distortion resulting from one or more poles on the negative real axis by means of all-pole network functions. (2) A method for the exact equalization of gain distortion in the approximation band. (3) The approximation of the so-called "brick wall" and the linearly decreasing gain functions by means of biquadratic network functions. (4) The reduction of the degree of a given network function. (Author)

Electrical Engineering Research Lab., U. of Illinois, Urbana.
SYNTHESIS OF DOUBLE-TERMINATED ACTIVE NETWORKS, by King Sun Fu. Technical note no. 11 on Contract AF 49(638)63. 4 Mar 60, 32p. 14 refs. AFOSR-TN-60-368.
Order from LC mi$3.00, ph$6.30 PB 146 919

Methods are given for the synthesis of double-terminated active networks for zeros of transmission at zero, infinity, and on the imaginary axis, and also complex zeros of transmission. The network configuration used is a bridge-type active network containing negative impedance converters. (Author)

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
TRANSISTORIZED FOUR-SEGMENT COMMUTATOR FOR A DIRECT-CURRENT MACHINE, by Frederick L. Schwartz. Rept. on Contract AF 33(616)3984. Feb 60, 47p. 18 refs. WADC Technical rept. 59-682.
Order from OTS $1.25 PB 161 721

The main features of this electronic commutator are: (a) commutation is performed on the stator windings by means of an eight-switch arrangement; (b) the rotor position signal for controlling the switching operations is obtained from two Hall generators mounted in the air-gap of a separate machine which is rigidly coupled to the shaft of the commutated machine; (c) transistors are used as the switching elements and in the control circuitry; (d) the commutator switches are bilateral, allowing the machine to run either as a d-c motor or generator. A machine using the electronic commutator was successfully run as a d-c motor and generator at an input power level of 240 watts. The electronically commutated machine is capable of running at an input power level of 600 watts. Two sets of slip rings were the only sliding contacts required for the operation of the machine. A comparison between the electronic and mechanical commutator in terms of size, reliability, and efficiency shows that more work must be done, especially on solid-state switching devices, before the electronic commutator will be practical for moderate- and high-power machines. (Author)

Electronic Tech. Lab., Wright Air Development Div., Wright-Patterson, AFB, Ohio.
PHOTOCATHODE SIGNAL-TO-NOISE LIMITATIONS IN PICKUP TUBES, by Melvin R. St. John. Rept. on Electronic Tubes and Transistors. Feb 60, 25p, WADC Technical note 59-363.
Order from OTS $0.75 PB 161 728

The maximum signal-to-noise ratio of pickup tubes is limited by the noise due to statistical fluctuations in photoemitted electrons. This maximum has not been achieved in any pickup tube because of additional noise introduced into the tube by the scanning beam. This report shows the theoretical maximum signal-to-noise ratio that can be achieved under the specified conditions plus graphical illustrations of several approaches toward achievement of this limit. The treatment is not rigorous, but rather a highlight presentation to convey a better understanding of the problems to be considered when very low light levels are involved. (Author)

Electronic Tech. Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
THERMIONIC ENERGY CONVERTER, by Walter L. Knecht. Rept. on Thermionic and Solid State Electronic Technology. Mar 60, 54p. 4 refs. WADD Technical rept. 60-128.
Order from OTS $1.50 PB 161 713

High-vacuum and gas-filled thermionic energy converters are reviewed. Emphasis is placed on the significant phenomena underlying the operation of these two classes of converters. A treatment of fundamental thermionic emitter characteristics is given. The complex variety of simultaneous processes occurring in the plasma of gas-filled converters is illustrated. Principal problem areas existing in the field of both converter types are shown. The present state of the art in this field is discussed in connection with the results obtained with small-sized device samples developed up to date. Future applications of thermionic converters are projected, and, in turn, the report refers to the current need of continued applied research efforts aimed at advancing the state of the art from the presently available thermal conversion efficiency of about 10 percent up to the theoretically feasible level of approximately 30 percent. (Author)

Electronics Research Lab., U. of California, Berkeley.
THE COMMON COLLECTOR-COMMON EMITTER PAIR, by M. S. Ghausi and D. O. Pederson. Rept. on Contract N7onr-29529. 11 May 59, 18p. 8 refs. Rept. no. 87; IER Series no. 60, issue no. 236; AD-220702.
Order from LC mi$2.40, ph$3.30 PB 146 093

The analysis and design are presented of a CC-CE pair selected from a cascade of identical pairs. The primary interest is in low pass broadband amplifiers. Simple equivalent circuits for the pair are developed and a design procedure is given to achieve a flat-type magnitude transmission characteristic in the pass band. The gain bandwidth factor of a CC-CE pair is compared with the other broadband low pass amplifiers using the common emitter configuration with various broadbanding techniques. These other broadbanding techniques include: resistive broadbanding, series-peaking, local series feedback of a parallel RC network in the emitter lead and shunt-peaking. It is shown that for large bandwidths the combinational pair of CC-CE is superior in gain-bandwidth factor except for the shunt-peaked amplifier. (Author)

General Electric Co., Schenectady, N. Y.
INVESTIGATION OF UNIMODE ANODE TECHNIQUE. Final engineering rept. for 10 July-27 Sep 57 and 20 Jan-20 May 58 on Contract AF 30(602)1768. 12 Aug 58, 84p. 3 refs. RADC-TR-58-150; AD-205 916.
Order from LC mi$4.80, ph$13.80 PB 146 510

An analysis of the unimode problem, combining equivalent circuits and field theory analysis, was made. Several methods of unimoding were investigated, followed by the actual design of anodes using these methods. The unimode approach was then applied to new devices and experimental results obtained. (Author)

General Electric Co. [Schenectady, N. Y.]
A PROCEDURE FOR ESTIMATING OPERATING TEMPERATURES OF ELECTRONIC COMPONENTS, by Glen E. McIntosh. 15 Jan 53, 14p. 2 refs. Proj. Hermes Heat Transfer memo. no. 49.
Order from LC mi$2.40, ph$3.30 PB 145 984

General Electric Microwave Lab., Palo Alto, Calif.
COMPUTER APPLICATIONS, by V. Met, M. P. Forrer, and T. M. Shaw. Final rept. for Mar 58-June 59 on Contract Nonr-2127(00). [1959] 38p. 19 refs. Rept. R59ELM 79-5.
Order from LC mi$3.00, ph$6.30 PB 147 452

Contents:
Analysis of millimicrosecond pulse transmission, pub. in proceedings of the IRE 46:1830-1835, Nov 58.
Experimental and theoretical investigations of the regenerative pulse generator
Spin echo storage
(See also PB 143 986)

Granger Associates, Palo Alto, Calif.
ENGINEERING TEST MODEL, ANTENNA AS-1019(XE-1)/TRD. DESIGN AND FABRICATE 50-320 MC DF ANTENNA, by R. E. Hunter. Quarterly progress rept. no. 2, 1 Nov 59-1 Feb 60, on Contract DA 36-039-sc-84533. [1960] 10p.
Order from LC mi$1.80, ph$1.80 PB 147 424

The majority of effort during this period was expended finalizing the design of the D/F atenna array with its supporting structure and preparing engineering drawings for these items for release to the manufacturing departments. The stress analysis was based upon wind loadings of 25 pounds per square foot (100 mph winds) from a direction relative to the antenna found to provide the maximum loads. Besides contractual environmental requirements, the D/F antenna array was designed to withstand handling and mis-handling of components and assemblies during field installation. These conditions were considered in conjunction with the weight limit established by the contractual specifications. The engineering drawings were prepared to meet military specifications as much as possible and specify all military specifications pertaining to the production of the parts. Fabrication was started on the first unit and associated tooling. Any items requiring long procurement time were ordered for both units. (Author) (See also PB 147 423)

Granger Associates, Palo Alto, Calif.
ENGINEERING TEST MODEL, ANTENNA AS-1019(XE-1)/TRD: A LOW FREQUENCY EXTENSION OF MODIFICATION KIT ELECTRONIC EQUIPMENT MK-383/TRD. DESIGN AND FABRICATE 50-320 MC DF ANTENNA, by R. E. Hunter and R. B. Kolbly. Quarterly progress rept. no. 1, 1 Aug-1 Nov 59, on Contract DA 36-039-sc-84533. 2 Jan 60, 31p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 147 423

The electrical design has been finalized using a log-periodic transposed-dipole array as the basic element. The log-periodic antenna has the characteristic that its radiation and impedance characteristics repeat as the frequency is changed by a factor, hence very large bandwidths with essentially constant radiation and impedance characteristics are obtainable. Two of these elements are mounted on the same axis to give both horizontal and vertical polarization; and three of these structures, consisting of two elements each, are arrayed forming the complete antenna. The antenna parameters have been optimized and are given in this report. Patterns for all modes of operation, as well as illustrative developmental patterns, are given. Impedance data for the element is also given. The VSWR of one antenna, relative to 75 ohms, is 1.3:1. For lobe-switched operation the half-power beamwidths are 42 degrees and 45 degrees for horizontal and vertical polarization, respectively. The equal-amplitude points are between 3 and 4 db for vertical polarization and from 2.8 to 3.6 db for horizontal polarization. In single-lobe operation the half power beamwidth is 65 degrees for horizontal polarization and 95 degrees for vertical polarization. (Author)

Hughes Aircraft Labs., Culver City, Calif.
STUDY OF ATOMIC AND MOLECULAR RESONANCES FOR MICROWAVE GENERATION AND AMPLIFICATION, by T. Maiman, R. Hoskins, and D. Devor. Quarterly progress rept. no. 6, 15 Mar-15 June 59, on Contract DA 36-039-sc-74967. [1959] 17p. 12 refs. AD-228 178.
Order from LC mi$2.40, ph$3.30 PB 147 425

X-band ruby maser operation was observed up to a temperature of 195°K with dry ice used as a coolant. It was found that ruby crystals with high chromium content functioned poorly (low gain-bandwidth product) at 4.2°K but behaved normally at higher temperatures. An explanation based on cross relaxation is presented. A noise temperature of 100°K and a gain-bandwidth product of 14 Mc were measured for a maser operating at 77.4°K (temperature of liquid nitrogen). Preliminary results on calculations of the fine structure levels of Cr^{+3} in TiO_2 (rutile) are reported. Pulsed magnetic field experiments were conducted with ruby as the paramagnetic material. Inversion of successive spin levels by adiabatic fast passage at X-band followed by the application of a pulsed magnetic field resulted in pulsed amplification and oscillation at several frequencies from 14 kmc to 28 kmc. The rapid attainment of a Boltzmann distribution of spin populations when the energy levels become equidistant in a multilevel spin system was demonstrated directly. (Author)

Integrated Range Mission, White Sands [Missile Range] N. Mex.
A MICROWAVE TELEMETRY RELAY, by Leonard S. Taylor. 15 Apr 58, 88p. AD-216 078L.
Order from LC mi$4.80, ph$13.80 PB 147 367

A 2200 Mcps multichannel telemetry relay system has been developed. This equipment has been designed to provide a high capacity net interlinking all data recording sites and the fixed and mobile receiving stations on the proving ground. In addition, simultaneous calibration of all stations has been made possible. The relay employs the superheterodyne principle to translate all the VHF telemetry signals as a unit to the microwave region for transmission to the recording stations. The system features a large dynamic range. Close channel spacing is utilized for efficient use of bandwidth. Unattended operation of the equipment is possible. (Author)

Ionosphere Research Lab., Pennsylvania State U., University Park.
INSTRUMENTATION FOR THE DETERMINATION OF IONOSPHERIC POLARIZATION BETWEEN 100 AND 1,000 KC/S AND PRELIMINARY DATA, by H. N. Carlson. Scientific rept. no. 129 on Ionospheric Research, Contract AF 19(604)3875. 1 Feb 60, 41p. 10 refs. AFCRC-TN-60-406.
Order from LC mi$3.30, ph$7.80 PB 146 897

Equipment is described that receives ionospheric echoes over the swept range of radio frequencies 50-1000 kc/s and resolves them into their two circular components. This is accomplished by phase shifting and adding at a constant intermediate frequency. Circuits are designed for fast recovery since operation near the transmitter is necessary for RF tracking. Preliminary results are presented. (Author)

Keystone Electronics Co., Philadelphia, Pa.
INDUSTRIAL PREPAREDNESS STUDY ON MINIATURE SIZE QUARTZ CRYSTALS. COMPLETION REPORT FOR STEP I: INDUSTRIAL PREPAREDNESS STUDY ON CR-55/U CRYSTAL UNITS, by James M. Ronan. Rept. on Contract DA 36-039-sc-54696. 15 Jan 58, 33p.
Order from LC mi$3.00, ph$6.30 PB 137 445

Manufacture of CR-55/U quartz crystal units in the frequency range of 17.0 MC to 60.750 MC has not proven to be too difficult. Standard equipment was used for fabrication.

Land-Air, Inc., Holloman, N. Mex.
DEVELOPMENT OF MIRAN REMOTE OPERATION. Final rept. on Contracts DA 29-040-ORD-1010 and DA 29-040-ORD-1302. Dec 58, 83p. 5 refs. LA-58-13; AD-214 433.
Order from LC mi$4.80, ph$13.80 PB 146 980

Automation of the Miran Relay Stations has been accomplished with the development of remote-control equipment. By means of a modulated RF signal, an operator at the Master Station is able to activate Miran equipment at distant Relay Stations, and to de-activate the equipment on completion of a mission. Considerable savings in manpower, travel time, and vehicles are effected. This report incorporates a description of the equipment and instructions for installation and operation. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A FIXED-CAP UHG TR TUBE, by C. W. Jones, C. E. Muehe, and S. J. Miller. Rept. on Contract AF 19(122)458. 29 Mar 57, 23p. 7 refs. Technical rept. no. 155; AD-147 407.
Order from LC mi$2.70, ph$4.80 PB 146 979

The existing TR tubes used in the region of the frequency spectrum between 1200 and 3000 Mcps are not satisfactory for use in UHF applications. This report describes a fixed-gap TR tube and its accompanying circuits that have been used successfully in UHF radar applications.

Material Lab., New York Naval Shipyard, Brooklyn.
EVALUATION OF BRAID COATINGS FOR CABLE CONDUCTORS WITH CLASS E INSULATION, by Samuel H. Behr and Edward J. Hoerauf. Final rept. 27 May 58, 9p. Lab. project 5248-111; AD-206 089.
Order from LC mi$1.80, ph$1.80 PB 147 368

Nylon lacquers with a four mil wall thickness will give substantial abrasion resistance providing they are applied in several thin coats with adequate heat drying between coats or after coating. Thinner walls of extruded nylon will give equal abrasion resistance. However, a braid saturant is necessary under the extruded nylon to lay down the glass fibers before tubing and also retard the flow of water through the glass braid. The improved abrasion apparatus described in this report will compare the abrasion resistance of braid coating materials with reasonable accuracy and is recommended for inclusion in the forthcoming amendment to specification MIL-C-2194B. (Author)

McCoy Electronics Co., Mount Holly Springs, Pa.
FINAL TECHNICAL AND PROCESS MANUAL APPLYING TO INDUSTRIAL PREPAREDNESS STUDY COVERING TYPE CR-55/U CRYSTAL UNITS. Rept. on Contract DA 36-039-sc-66073. [1958] 46p.
Order from LC mi$3.30, ph$7.80 PB 137 421

Michigan U. [Research Inst.] Ann Arbor.
SERIES-PARALLEL GRAPHS AND LATTICES, by Calvin C. Elgot and Jesse B. Wright. Rept. on Project Michigan, Contract Nonr-1224(21). 25 Feb 58, 26p. 2144-1120-M; AD-204 494.
Order from LC mi$2.70, ph$4.80 PB 138 247

A path in a doubly rooted graph $G=(N, E, R, p_0, p_1)$ is a sequence of distinct points in G, initiating with p_1 and terminating with p_2. The link relation of $G=(N, E, R, p_0, p_1)$ is the set of ordered pairs of points which are consecutive in some path. A graph is admissible if each of its points is in some path and for each edge of the graph with end points a, b, either (a, b) or (b, a) is an element of its link relation. Theorem: If $G=(N, E, R, p_0, p_1)$ is admissible, then it is series-parallel if and only if its link relation is asymmetric. This theorem is proved by obtaining intermediate results which characterize the transitive closure of the link-relations of series-parallel graphs (as series-parallel lattices). (Author)

Michigan U. Research Inst., Ann Arbor.
TRANSISTOR-DIODE LOGIC, by R. A. Carlsen. Technical memo. no. 66 on Contract DA 36-039-sc-63203. Oct 58, 22p. 6 refs. 2262-197-T; AD-227 096.
Order from LC mi$2.70, ph$4.80 PB 146 942

The design features are discussed of direct-coupled transistor diode logic. The discussion includes comments on the effect of diode reverse transients on circuit performance, the dependence of the number of gate drives on transistor and diode properties, and isolation obtained between input and output gate terminals for the circuit presented. The unique feature of the circuit is the use of the low collector-to-emitter transistor as a replacement for a diode clamp. (Author)

Microwave Associates, Inc., Burlington, Mass.
HIGH REPETITION RATE BROADBAND DUPLEXER, by Emanuel L. Horn. Quarterly progress rept. no. 5, 15 Aug-15 Nov 59, on Contract DA 36-039-sc-78165. [1959] 14p. AD-232 341.
Order from LC mi$2.40, ph$3.30 PB 147 428

Measurements of arc loss and recovery time have been continued at low repetition rates. The data show that although the dumbell type iris structure yields lower values of arc loss it also yields larger values of recovery time than the encapsulated window. A design investigation has been initiated to fabricate tubes with all elements encapsulated in order to eliminate the difficulties normally encountered in fabricating dual S band TR tubes. (Author) (See also PB 146 494)

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Lawrence Gould. Quarterly progress rept. no. 4, 1 July-30 Sep 59, on Contract DA 36-039-sc-78233. 29p. AD-231 514.
Order from LC mi$2.70, ph$4.80 PB 146 795

The study of Tee circulators as an element in a high duty cycle duplexer has been continued. Operation at 180 watts average power in X band has been achieved. The characteristics of leakage power and recovery time for crystal protector TR tubes have been measured for various mixtures of argon, water, and ammonia. The most promising gas fill is a mixture of water and ammonia which yields a recovery time independent of temperature from -55°C to 85°C with a recovery time value of the order of 0.2μs. The analysis of the silicon diffuse junction diode in a microwave circuit is considered as a possible element in a high duty cycle duplexer. (Author) (See also PB 146 495)

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Lawrence Gould. Quarterly progress rept. no. 5, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-78233. [1960] 16p.
Order from LC mi$2.40, ph$3.30 PB 146 796

A circulator can be designed having a 10% bandwidth. The recovery time characteristics of a crystal protector TR tube have been investigated at low values of peak power. The results indicate that excessively large values of recovery time can be achieved during the ranges of incident power in which the input gap and window fire. The analysis of the silicon diffused junction diode as an element in a high duty cycle duplexer has demonstrated inferior performance at X band because of the series inductance associated with the diode package. (Author) (See also PB 146 795)

Microwave Engineering Labs., Inc., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS, by Roy W. Roberts. Quarterly progress rept. no. 10, 1 Aug-31 Oct 59, on Contract DA 36-039-sc-73278. [1959] 24p. 3 refs. AD-231 484.
Order from LC mi$2.70, ph$4.80 PB 146 941

A high moment nickel-zinc ferrite was made in the laboratory for use in harmonic generation. Measured linewidths were approximately 45-60 oer. This material had a high efficiency in 2 mm generation, giving approximately 10-20 peak output. Further experiments were run on the ferrite parametric amplifier and magnetic Q, gain, and noise power were measured. Three additional batches of single crystal garnets were grown with better temperature control and mechanical stability. One batch was grown with a modified flux of PbO and PbF_2 and using a technique of recharging the crucible so that total reactant mass was increased 3-fold over previous runs. This batch gave many large crystals with linewidths as narrow as 2.5 oer. (Author)

Microwave Lab., Stanford U., Calif.
BASIC MICROWAVE RESEARCH, by M. Chodorow. Scientific rept. no. 17, 1 July-30 Sep 59, on Contract AF 19(604)1930. Nov 59, 27p. 5 refs. M. L. Rept. no. 662; AFCRC-TN-60-101; AD-232 521.
Order from LC mi$2.70, ph$4.80 PB 145 968

Contents:
Microwave tube studies
- Studies in the theory of coupled cavities
- Investigation of the behavior of velocity-modulated electron beams in long gaps
- Electron beam parametric amplifier

Plasma physics studies
- Electron beam interaction with a plasma
- Electron plasma waves
- Parametric effects
- Electrostatic sound waves
- Plasma confinement
- Thermal plasma
- Noise in plasmas
- Harmonic generation in plasmas
- Microwave measurements in plasmas

Ferrite nonlinear propagation
(See also PB 145 574)

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
ELECTRONICALLY-TUNABLE MICROWAVE OSCILLATIONS AND DETECTION AND MIXING PROPERTIES OF A COAXIAL MAGNETRON, by R. M. Hill and F. A. Olson. Rept. on Contract DA 36-039-sc-73188, Continuation of Contract DA-36-039-sc-71053. 30 June 57, 30p. 16 refs. Technical rept. no. MPL-7.
Order from LC mi$2.70, ph$4.80 PB 146 789

Results are given of preliminary investigations of the behavior of self-excited electron oscillations originating in the space charge region between a hot wire filament and a cylindrical anode in the presence of a magnetic field. This coaxial magnetron is observed to oscillate and emit radiation at a frequency nearly equal to the electron cyclotron frequency divided by the $\sqrt{2}$. Although this phenomenon has been mentioned in the early magnetron literature, it has received little attention from a practical standpoint. By varying the magnetic field and programming the anode voltage, it is possible to tune the frequency of this tube and the possibility of rugged construction, it appears promising as a useful local oscillator tube that could be designed to cover at least octave bandwidths throughout the frequency range from about 300 megacycles to 12 kilomegacycles.

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ELECTROMECHANICAL PULSE GENERATORS, by Enrico Levi. Rept. on Contract Nonr-839(05). 6 July 59, 36p. Research rept. R-751-59; PIB-679; AD-220 852.
Order from LC mi$3.00, ph$6.30 PB 147 084

Generation of electrical pulses directly at the electromechanical energy conversion stage may prove to be most economical for radar and fusion research applications, in view of the ever increasing power levels required. Conventional types as well as the induction pulser, considered as a model for future thermonuclear generators, are described in terms of a fundamental set of equations of which the solution is presented for limiting cases. On this basis it is possible to evaluate the relative merits of each type, to deduce design principles and derive efficiency expectancies and ultimate power capabilities. (Author)

Microwave Research Inst., Polytechnic Inst., of Brooklyn, N. Y.
STUDY OF MICROWAVE FERRITE DUPLEXERS, by Lawrence Levey and Leo M. Silber. Final rept. for 1 Apr 58-30 Sep 59 on Contract DA 36-039-sc-78000. 15 Jan 60, 44p. 5 refs. Rept. no. R-795-59; PIB-723.
Order from LC mi$3.30, ph$7.80 PB 146 792

The development is summarized of a microwave circulator in which the ferrite element is in the form of a hollow tube of rectangular cross-section. This ferrite geometry lends itself to fast switching applications. A discussion is included of the requisite properties of ferrite materials for optimum operation of a switching circulator and describes the development of suitable materials and the means by which they were fabricated into the necessary shapes. The switching performance of a prototype circulator is described. (Author)

Midland Mfg. Co., Inc., Kansas City, Kan.
INDUSTRIAL PREPAREDNESS STUDY ON TIGHTENED TOLERANCE CR-54/U CRYSTAL UNITS CR-(XM-9)/U. Final rept. for 31 Dec 57-7 Apr 58 on Contract DA 36-039-sc-75936. 23 May 58, 47p.
Order from LC mi$3.30, ph$7.80 PB 137 440

An outline for the process specification for tightened tolerance CR-54/U quartz crystal units is presented. (See also PB 137 441)

Midland Mfg. Co., Inc., Kansas City, Kan.
INDUSTRIAL PREPAREDNESS STUDY ON TIGHTENED TOLERANCE CR-54/U CRYSTAL UNITS CR-(XM-9)/U. Quarterly progress rept. nos. 1 and 2 for period through 31 Dec 57 on Contract DA 36-039-sc-75936. 14 Mar 58, 22p.
Order from LC mi$2.70, ph$4.80 PB 137 441

Techniques involved in changing the production process to producing an acceptable yield under the tightened tolerance condition were developed and tested in an effort to determine their suitability.

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Annual rept. no. 1 (4th quarter) 1 Mar-1 June 57, on Contract DA 36-039-sc-72378. [1957] 32p. 2 refs. AD-138 882.
Order from LC mi$3.00, ph$6.30 PB 147 415

A number of crystal oscillators presently used in commercial equipment have been analyzed to determine the maximum value of series R capable of sustaining oscillations. The three oscillators to be used in the final instrument are individually described. Data obtained with experimental models and available crystals are given for the high and low bands. The composite test set is described both functionally and physically. (Author) (See also PB 147 418)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Final rept. for 13 Feb 56-30 Nov 58 on Contract DA 36-039-sc-72378. [1958] 97p.
Order from LC mi$5.40, ph$15.30 PB 147 422

The present status of the "Unwanted Crystal Mode Detector" is discussed. A complete schematic for each of the two units comprising the complete detector test set is illustrated and described. Circuitry for the low, mid and high band detectors is covered extensively as are the special voltage metering circuits. The panel layout of each unit is illustrated. The functions of all variable controls are discussed. The operating procedure for testing a crystal for harmful spurious modes is covered in detail. A series of reference oscillators chosen from ARF designs are described and their use in determining which spurious responses are harmful is discussed. Spurious data obtained from the entire quantity of two hundred crystals furnished by the Signal Corps is presented in tabular form. The results are analyzed from the standpoint of the Detectors ability to detect all crystal modes considered harmful. The gain calibration curves for the two prototype units are illustrated. The twenty-seven crystals previously tested at the Signal Corps, have been tested at their maximum allowable drive level whenever possible. This data is presented in tabular form. (Author) (See also PB 147 421)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Quarterly rept. no. 1, 1 June-1 Sep 56, on Contract DA 36-039-sc-72378. [1956] 34p. 1 ref.
Order from LC mi$3.00, ph$6.30 PB 147 416

The required instrument is divided into the following three parts - R. F. oscillator-selective network - metering. Complete functional details are given for each of these proposed parts. The R. F. oscillator has been built and the circuit is given. Work has begun on an R. F. detector, having good response characteristics between the frequency limits of 1 to 110 megacycles, which is to be used in conjunction with the metering circuits. The crystal oscillators to be used in determining the spurious specifications are described. The two oscillators most likely to prove unstable, the Colpitts and the Butler, are now being constructed. (Author)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Quarterly rept. no. 2, 1 Sep-1 Dec 56, on Contract DA 36-039-sc-72378. [1956] 23p. 1 ref.
Order from LC mi$2.70, ph$4.80 PB 147 417

The crystal oscillators to be used in determining the spurious specification are described. Circuits of these oscillators at three test frequencies are given. Two methods which will be used at the lowest test frequency to experimentally determine the susceptibility of an oscillator to operate on a spurious response are explained. The results of the crystal procurement program to date are given. (Author) (See also PB 147 416)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Quarterly rept. no. 3, 1 Dec 56-1 Mar 57, on Contract DA 36-039-sc-72378. [1957] 57p. AD-133 350.
Order from LC mi$3.60, ph$9.30 PB 147 418

The Butler and Hartley oscillator circuits were analyzed to determine the highest values of crystal spurious resistances capable of sustaining oscillations. Schematic diagrams are given of the 6- to 7-mc Butler and Hartley oscillator circuits. By utilizing the equations derived, the highest values of spurious resistances capable of controlling oscillations in these 2 circuits were computed. The main and spurious mode resistances and frequencies of the crystals used to test the oscillators are tabulated, and the spurious responses detected by the test oscillators are indicated. The over-all ability of the Hartley oscillator to detect spurious responses is given by a curve of highest spurious resistances detected vs the percentage of the frequency difference from the main response. A similar curve which is expanded to include only those responses within 1% of the main response frequency is also obtained by the use of the similated spurious technique. (See also PB 147 417)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Quarterly rept. no. 5, 1 June-1 Sep 57, on Contract DA 36-039-72378. [1957] 31p. AD-149 751.
Order from LC mi$3.00, ph$6.30 PB 147 419

The completed laboratory experimental model of the Crystal Spurious Mode Detector is described. Experimental high band oscillators using an "Inductuner" to cover the entire band are described. One oscillator is a standard Butler and the other a grounded-grid circuit with the feedback taken from a capacitor tap. Three standard grounded-grid oscillators specifically constructed for high frequency operation and designed to cover the high band are described. The results obtained by testing available crystals are given. Two oscillators, constructed for the purpose of defining an "unwanted crystal mode", are described and results given. (Author) (See also PB 147 415)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Quarterly rept. no. 6, 1 Sep 57-1 Feb 58 on Contract DA 36-039-sc-72378. [1959] 44p.
Order from LC mi$3.30, ph$7.80 PB 147 420

A summary is given covering the low, mid and high-band detectors. Included are the major electrical and mechanical changes for the mid-band detector. Development information covering all three bands is presented. The inductuner oscillator is compared with the three separate oscillator method of covering the high-band. Tuning requirements and the present status of the low-band oscillator are given. Spurious detection data covering the mid-band (6-40 Mc) and the high-band (40-125 Mc) ranges are presented and analyzed. (Author) (See also PB 147 419)

Motorola, Inc., Chicago, Ill.
INVESTIGATION OF METHODS AND TECHNIQUES FOR DETECTING UNWANTED CRYSTAL MODES, by B. Niederman and J. Loos. Quarterly rept. no. 7, 1 Feb-1 May 58, on Contract DA 36-039-sc-72378. [1958] 51p.
Order from LC mi$3.60, ph$9.30 PB 147 421

The status of the two prototype Unwanted Crystal Mode Detector units is discussed. A complete circuit diagram of each detector unit is illustrated and described. Functions of all variable controls are discussed. Metering circuits are also explained. The panel layout of both units is illustrated. The controls are described in detail. The operating procedure of testing a crystal for unwanted spurious modes is outlined. Spurious data obtained with the low frequency detector (1-40 Mc) using government supplied crystals are given. Data at 10 Mc, 30 Mc, 50 Mc, 75 Mc and 100 Mc using both prototype detector units and A.R.F. "reference" oscillators are presented. The results are analyzed from the standpoint of the Detectors ability to detect all crystal modes considered harmful. (Author) (See also PB 147 420)

National Union [Electric] Corp., Orange, N. J.
MINIATURE CATHODE RAY TUBE, R-2163, by F. Holborn and C. Bartholomew. Final engineering rept. on Contract AF 33(038)17345. [1953] 43p. AD-14 027.
Order from LC mi$3.30, ph$7.80 PB 146 916

Two versions of the tube were developed. The first uses a Willemite screen (P-1) which gives a green trace and has medium persistence. The second uses a long-persistence cascade phosphor (P-7). The tube envelope consists of lead glass (Corning 0120) except for the face plate, which is made of Fourco glass. A modified small-button 9-pin stem is used. Electrostatic focus and deflection are utilized in the electron gun which is supported in the envelope by 4 support springs. The springs also serve to absorb shock and vibration. About 10% of the cathode current reaches the screen, and the rest is absorbed by the limiting apertures. The tube passed the vibration test and a 500-g shock test. Both versions of the tube suffered

a burning of the phosphor screen during life tests. A life test period of 500 hr or less was considered to be more realistic than the 1000-hr test. The method of producing the tube is described. The tubes operated at LV, had good light output, and did not have an exposed exhaust tip.

Mound Lab., Miamisburg, Ohio.
NUCLEAR BATTERY, THERMOCOUPLE TYPE, by B. C. Blanke. Quarterly rept. no. 1, 1 Jan-31 Mar 57, on Contract R-50-799965-sc-01-91. 26 Apr 57, 18p. 6 refs. MLM-CF-57-4-34; AD 146 708.
Order from LC mi$2.40, ph$3.30 PB 147 127

The potential usefulness as a heat source for the thermal battery of 1300 radioactive isotopes was investigated. All but thirty-two have been eliminated because of too long or too short a half-life and/or excessive gamma radiation of the isotope or element. Further eliminations are being made on the basis of relative availability and costs. (Author)

National Bureau of Standards, Washington, D. C.
AN IMPROVED HYDROGEN ATOM BEAM FURNACE, by Ralph Klein and John Pararas. May 60, 9p. 2 refs. Technical note 47.
Order from OTS $0.50 PB 151 406

An improvement in the construction of the tungsten furnace for use in a hydrogen atom-beam apparatus has been effected by fabricating the furnace from a tungsten rod. This avoids the possibility of leakage of molecular hydrogen which may occur when the tungsten tube is made from rolled tungsten sheet, the technique used heretofore. The fabrication of the seamless furnace and the method of mounting are described. (Author)

National Union [Electric] Corp., Orange, N. J.
MINIATURE TWIN INDICATOR TUBE R-2164, by H. J. Koch. Final engineering rept. on Contract AF 33(038)17345. [1952] 51p. AD-13 884.
Order from LC mi$3.60, ph$9.30 PB 146 917

A twin indicator miniature equivalent of the 6AF6G was developed. The solder glass, poli-optic sealing, and fused glass techniques were employed in an effort to seal the tube in a vacuum after processing. It was concluded that it was impractical to seal a tube together in the bell jar under vacuum with a glass-to-glass seal. Another method was tried which consisted of sealing the bulb and stem in the usual manner and exhausting through a tubulation in the stem. To eliminate the projecting tip-off, the glass had to be mashed down while still soft. The first tubes made in this fashion developed stem cracks. Test diodes were made using Pb glass bulbs. Prior to tipping-off, the getters were flashed lightly to absorb gas liberated from the glass during the annealing period; however PB was reduced out of the glass. Life tests indicated that tubes having soft glass (lime) envelopes can be made to operate at bulb temperatures up to 400°C.

Naval Civil Engineering Lab., Port Hueneme, Calif.
CONTIGUOUS WRAPPING OF TRANSMISSION LINE CONDUCTORS WITH HIGH-MU TAPE FOR LARGE RADIO-INTERFERENCE ATTENUATION, by Don B. Clark and Robert D. Hitchcock. Interim rept. 7 Mar 60, 47p. 10 refs. Technical rept. 062.
Order from LC mi$3.30, ph$7.80 PB 147 115

Wrapping high-permeability SiFeMg tape around transmission line lowers radio frequency energy in normal interference frequency ranges. In theory, a long conductor coated with high-permeability material has high skin effect losses at frequencies above those of power transmission. Three long conductors were wrapped with thin, high-permeability tape; two conductors had small helical air-gaps between wrappings to reduce saturation effects. These two had about half the attenuation of the fully wrapped line, lower standing wave ratios and lower characteristic impedance phase shift. (Author)

Naval Ordnance Lab., Corona, Calif.
TEST SET, ELECTRICAL OUTPUT, FUZE, MK 378 MOD O: DESCRIPTION AND OPERATION. 7 Apr 60, 66p. NAVWEPS rept. 5988; NOLC rept. 494; Includes NAVORD OS-(10325-10326).
Order from LC mi$3.90, ph$10.80 PB 147 285

This report presents a description and instructions for operation of the Test Set, Electrical Output, Fuze, Mk 378 Mod O, which was developed at the Naval Ordnance Laboratory Corona for use in factory acceptance testing of the Switch, Firing, Electronic, Mk 73 Mod O, and the Triggering Device, Fuze, Mk 3 Mod O. The set is constructed in two sections, so that it may be used either for combined tests of the triggering device and firing switch or for separate testing of either component. Appendixes A and B present the original Ordnance Specifications (NAVORD OS 10326 and NAVORD OS 10325) for the two components to be tested. (Author)

Naval Ordnance Lab., White Oak, Md.
MAGNETIC PULSE MODULATORS, by Walter Raskin. 25 Aug 58, 21p. 9 refs. NAVORD rept. 6190; AD-206 318.
Order from LC mi$2.70, ph$4.80 PB 147 389

The magnetic pulse modulator of the Melville type is analyzed, the present state of the art is summarized, and engineering limitations imposed by components are discussed. A bibliography of literature in this field is included. (Author)

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
A SMALL-TANK CALIBRATION SYSTEM, by Gerald F. Ginty. 31 Aug 55, 13p. USL Research and Development rept. no. 292.
Order from LC mi$2.40, ph$3.30 PB 147 602

The small-tank calibration system measures hydrophone sensitivity and directivity pattern in the frequency range from 5 to 150 kc by means of AC tonal pulses. A pulse of the desired frequency is gated into a transmitting power amplifier and projector and is received by the hydrophone under test. The received

pulse is then logarithmically amplified; any desired part of the pulse is selected by a receiver gate, and the gated portion is peak detected and stored as a direct voltage. The direct voltage is fed to a sine-cosine potentiometer, the output of which drives a cathode-ray tube in order to provide a PPI display of received decibel level as a function of hydrophone bearing. In addition, the direct voltage is chopped and used to drive conventional polar ink recorders. The transmitted and received pulses are controllable in duration and repetition rate and may be set in accordance with considerations of tank dimensions and transducer-response time. The repetition rate of transmitted and received pulses may be varied from 15 to 60 pulses per second. The duration of the transmitted pulse may be varied from 100 microseconds to 100 milliseconds, and the duration of the receiver gate may be varied from 50 microseconds to 10 milliseconds. Time delay between the transmitter and receiver gates is variable between 100 microseconds and 100 milliseconds. (Author)

New York U. Coll. of Engineering, N. Y.
THE EFFECTS OF DISTORTION ON VIDEO CORRELATION, by M. Frankfort, B. Harris and others. Technical note on Contract AF 30(602)1655. 15 Oct 58, 69p. 16 refs. RADC-TN-58-360; AD-206 042.
Order from LC mi$3.90, ph$10.80 PB 146 173

An analysis is made of a video correlator which has distortion present in its input channels. In particular power law distortions, ideal limiting, and partial limiting, are considered. Assuming a sampling correlator and use of sufficient number of samples to make the central limit theorem applicable, the effect of power law distortion is found to be a few decibels drop in the output signal-to-noise ratio of the correlator. An exact analysis carried out for some limiting cases shows that even this small reduction may be due only to the approximations made in the general analysis. These results are obtained for distortion in one or both of the correlator input channels. It is felt therefore, that in many cases it may be possible to make considerable savings in equipment at only a small cost in performance by relaxing fidelity requirements on signal transmission to the correlator.

Office of Scientific Research and Development. Div. 13.
DIRECTION FINDER AND ANTENNA RESEARCH. Summary technical rept. vol 1, Contract OEMsr-1131. 1946, declassified 23 Apr 58, 299p. 123 refs.
Order from LC mi$11.10, ph$45.60 PB 139 790

Contents:
BTL high-frequency direction-finder research
NBS high-frequency direction-finder research
Study of radio pulse propagation
Ultra-high-frequency direction-finding study
Errors in direction finders
Correlation of DF errors with ionosphere measurement
Miscellaneous direction-finder research
UHF radio-sonde direction finder
Demountable short-wave direction finder
Direction finding by improvised means
Portable radio assault beacon
UHF direction-finding antenna study
Locating tanks by radio
UHF friendly aircraft locator
Electrical direction-finder evaluator
A study of sferics
Antenna patterns for aircraft
Airborne antenna design at UHF and VHF
Development of faired-in antennas
Miscellaneous antenna research

Office of Technical Services, Dept. of Commerce, Washington, D. C.
RELIABILITY AND QUALITY CONTROL (1950-1960). Apr 60, 9p. 125 refs. OTS Selective Bibliography 405.
Order from OTS $0.10 OTS SB-405

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations.

Olin Mathieson Chemical Corp., New Haven, Conn.
INDUSTRIAL PREPAREDNESS STUDY ON PAPER LINED BATTERIES TYPE BA-270/U-XPL, by S. M. Wajnowski. Quarterly progress rept. no. 19, 1 Dec 57-28 Feb 58, on Contract DA 36-039-sc-30266. 28 Feb 58, 12p.
Order from LC mi$2.40, ph$3.30 PB 138 084

Pacific Semiconductors, Inc., Culver City, Calif.
INTRINSIC-BARRIER TRANSISTOR TECHNIQUES (SILICON), by J. L. Buie. Quarterly rept. no. 8, 15 Apr-15 July 59, on Contract DA 36-039-sc-74887. [1959] 19p. PSI rept. no. 3000:15-23-Q; AD-229 488.
Order from LC mi$2.40, ph$3.30 PB 146 791

A sequence of design, fabrication, and characterization techniques was developed for very-high-frequency silicon transistors. In the course of evaluating these techniques, it was shown that a wide range of useful transistors could be constructed. These transistors demonstrated power outputs of 100 mw at 200 mc, 1 watt at 70 mc, 3/4 watt at 108 mc, and 5 watts at 10 mc. In addition, techniques-evaluation samples were delivered which exceeded these specific requirements, showing power output approaching 5 watts at 70 mc, and exceeding 3 watts at 100 mc, and 2 watts at 150 mc. An even wider range of frequency and power is known to be within the capability of the techniques developed. (Author) (See also 142 768)

Pan-Electronics Corp., Griffin, Ga.
INDUSTRIAL PREPAREDNESS STUDY: QUARTZ CRYSTAL UNITS CR-56/U; COMPLETION REPORT ON STEP 1. Rept. on Contract DA 36-039-sc-72680. [1958] 28p.
Order from LC mi$2.70, ph$4.80 PB 137 414

A process is described for the fabrication of CR-56/U Quartz Crystal Units in the range of 50 to 100 Megacycles. No drastic changes in normal production techniques were required although many refinements in existing procedures were found necessary to get acceptable yields.

Philco Corp., Philadelphia, Pa.
RESEARCH AND EXPERIMENTAL WORK ON MICROWAVE TRANSISTORS, by W. C. Follmer, M. M. Fortini and others. Quarterly progress rept. no. 6, 15 Apr-15 July 59, on Contract DA 36-039-sc-74988. [1959] 19p. 4 refs. Philco H-2153-6; AD-228 330.
Order from LC mi$2.40, ph$3.30 PB 146 489

Studies have been made of the frequency and power-handling capabilities of silicon NPN transistors operating as negative-resistance oscillators. The highest output power was 0.42 mw with a DC input of 205 mw. Investigation of the Esaki tunnel diode is being carried out. A microwave Hall oscillator was designed and built. See also PB 143 877.

Polytechnic Inst. of Brooklyn, N. Y.
RESEARCH ON AND DEVELOPMENT OF ION-SELECTIVE AND ION-SPECIFIC MEMBRANES FOR USE IN THE LARGE-SCALE, LOW-COST DEMINERALIZATION OF SALINE WATER BY SELECTIVE ELECTRODIALYSIS. Rept. on Contract no. 14-01-001-62. May 60, 77p. 42 refs. Office of Saline Water Research and Development Progress rept. no. 37.
Order from OTS $2.00 PB 161 694

The purpose of this investigation was to investigate known membrane systems which might be more permeable to ions with a double negative charge than to ions with a single negative charge, and to attempt the preparation of membranes of improved specificity. A membrane possessing this characteristic would be useful for removing sulfate from a solution of chloride and sulfate where the sulfate content is too high or to fractionate a mixture of the ions into two solutions, each one containing only one of the ions. Two commercial membranes, Nalfilm 2 and Nalfilm 4, were investigated. Four different heterogeneous membranes were prepared using anion exchange resins in a Dynel matrix. Tests were performed on the membranes to determine the amount of specificity. The various tests made on all the membranes indicate that other and more simple means may be found for determining the amount of ion-specificity in an ion-selective membrane than the relatively difficult procedure of measuring the transport numbers directly. It was demonstrated that the relative transport numbers for sulfate and chloride may vary from 0.75 to 1.12.

Radio Corp. of America, Harrison, N. J.
EVALUATION OF TWO TYPES OF S-BAND PULSED PENCIL-TUBE-AND-CAVITY TRANSMITTER UNITS. VOLUME 1: EVALUATION, by R. E. Brooks. Final rept. for 3 June 57-31 Jan 59 on Contract DA 36-039-sc-74845. [1959] 129p. AD-226 526.
Order from LC mi$6.30, ph$19.80 PB 145 963

This 3-volume report presents an evaluation of the performance of 2 types of S-band, pulsed, pencil-tube-and-cavity transmitter units. Vol. 1 presents the results, conclusions, recommendations, and proposed specifications of the RCA A-15095 plate-pulsed and A-15100 grid-pulsed developmental units. Vol. 2 contains the manufacturing specifications for the RCA developmental type A-15109 pencil tube used in both types of units, and manufacturing specifications for the two transmitter units. Vol. 3 contains the test data and X-ray pictures of each of the 200 units as well as drawings of the mismatch introducer developed for use in this contract. The major conclusion reached from this evaluation was that the greatest deterioration in power and frequency characteristics was obtained primarily under operating conditions that resulted in maximum peak current. A remarkable phenomenon observed was that operation of the units with reduced heater voltage increased life from about 150 hours to about 450 hours. The specified environmental conditions of shock, vibration, rotation, load mismatch, and increased pulse repetition rates were found to have little effect on the operation of these units. X-ray inspection techniques led to more realistic tolerances in the manufacturing specifications, and will serve as an important means of increasing yield during production. (Author)

Radio Corp. of America, Harrison, N. J.
EVALUATION OF TWO TYPES OF S-BAND PULSED PENCIL-TUBE-AND-CAVITY TRANSMITTER UNITS. VOLUME 2: MANUFACTURING SPECIFICATIONS, by R. E. Brooks. Final rept. for 3 June 57-31 Jan 59 on Contract DA 36-039-sc-74845. [1959] 153p. AD-226 527.
Order from LC mi$7.50, ph$24.30 PB 145 962

See also PB 145 963

Radio Corp. of America, Harrison, N. J.
EVALUATION OF TWO TYPES OF S-BAND PULSED PENCIL-TUBE-AND-CAVITY TRANSMITTER UNITS. VOLUME 3: TEST RESULTS, D, E and F, by R. E. Brooks. Final rept. for 3 June 57-31 Jan 59 on Contract DA 36-039-sc-74845. [1959] 145p. AD-226 528.
Order from LC mi$7.20, ph$22.80 PB 145 961

Contents:
X-ray photographs of 100 RCA A-15095 developmental plate-pulsed and 100 RCA A-15100 developmental grid-pulsed pencil-tube-and-cavity transmitter units
Test data on 100 RCA A-15095 developmental plate-pulsed and 100 RCA A-15100 developmental grid-pulsed pencil-tube-and-cavity transmitter units
The mismatch introducer
(See also PB 145 962, PB 145 963)

Radio Corp. of America, Princeton, N. J.
HIGH TEMPERATURE SEMICONDUCTOR MATERIALS AND DEVICES, by R. Bube, P. R. Celmer and others. Scientific rept. no. 1 for Oct 59-31 Jan 60 on Contract AF 19(604)6152, continuation of Contract AF 33(616)5029. 29 Feb 60, 53p. 20 refs. AFCRC-TN-60-178.
Order from LC mi$3.60, ph$9.30 PB 147 296

The program is divided into four main sections: preparation of pure material, impurity behavior, evaluation of material properties, and device studies. Research in this past period has been concerned almost completely with GaAs. The progress in each activity is summarized. (See also PB 161 541)

Radio Corp. of America, Harrison, N. J.
INDUSTRIAL PREPAREDNESS STUDY: LOW-NOISE TRAVELING-WAVE AMPLIFIER, by E. Goldman. Quarterly progress rept. no. 6, 1 Oct-31 Dec 57, on Contract DA 36-039-sc-72733. [1957] 15p.
Order from LC mi$2.40, ph$3.30 PB 137 798

The general purpose of the contract is to provide facilities for the production of a low-noise traveling-wave amplifier, type 6861; and to produce a sample run of 50 tubes. All equipment has been received, installed and is in operation. Type approval subject to satisfactory completion of life test has been granted. The pilot run tubes have been produced.

RCA Victor Div., Radio Corp. of America, Camden, N. J.
INSTRUCTION BOOK FOR HOMING BEACON EQUIPMENT NAVY MODEL YG AND RADIO FREQUENCY MONITOR NAVY TYPE CRV-60047. Rept. on Contract NXss-33086. 28 Mar 45, 238p. NAVSHIPS 900,510.
Order from LC mi$10.20, ph36.30 PB 146 172

Raytheon Co., Waltham, Mass.
STUDY OF PLATINOTRON DEVICES. Quarterly rept. no. 3, 1 May-1 Aug 59, on QKS779/QR814, Contract DA 36-039-sc-78229. [1959] 57p. AD-229 004.
Order from LC mi$3.60, ph$9.30 PB 147 427

The QKS-779 identifies Task 3.1 which calls for a research program aimed at developing a microwave tube capable of producing a minimum of 100 watts CW power and operating in the vicinity of 35 kilomegacycles. The tube should have a minimum bandwidth of 10%. Task 3.6, identified as the QR-814, concerns itself with the investigation of the problem of matching external transmission lines to the platinotron network in an improved manner for better electrical characteristics and greater power handling capability. During this period both of these tasks received considerable attention. The development of the QKS-779 was advanced to the point where the first tube had been pumped and some information obtained. The work on the QR-814 consisted of investigating both a coaxial type of match and a match having more direct physical connection between the waveguide and the platinotron network. The latter arrangement would eliminate the disadvantages of the parallel wire transmission line in current use in the transition of the QK680. (Author)

RCA Defense Electronics Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM, by Paul K. Taylor. Quarterly rept. no. 1, 1 Apr-30 June 58, on Contract DA 36-039-sc-75968. [1958] 149p. MM-206.
Order from LC mi$7.20, ph$22.80 PB 146 042

The Micro-Module Concept is a new approach to electronic equipment design. The object is to take advantage of the increased component density and improve the volumetric efficiency of the units in order that equipment can be built that will be more easily transportable and still maintain the same or a higher degree of reliability. A screening process using DuPont silver paste that is brushed on, has merit and appears to be quite satisfactory on bodies used thus far. Tantalum electrolytic capacitors have been made using .0015 inch thick foil. Resistors have been built using evaporated metal oxide on glass, quartz and ceramics. An investigation was conducted to examine properties of core material suitable for toroidal construction of tuned circuits. The processing technique, for "in-plastic" sealing of pretested electrically good, drift transistors, was used to fabricate experimental transistor units.

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
RESEARCH ON SPEECH SYNTHESIS. Final rept. for 1 Mar 58-31 Oct 59 on Contract AF 19(604)2061. Dec 59, 18p. 14 refs. AFCRC-TR-60-101; AD-232113.
Order from LC mi$2.40, ph$3.30 PB 146 816

This report contains only a summary of the work, since more detailed descriptions appear in other publications that are listed in Appendix A. Implications of the results as related to possible future work are also discussed.

Rome Air Development Center, Griffiss AFB, N. Y.
DEVELOPMENT AND EVALUATION OF NAVARHO LONG DISTANCE NAVIGATION SYSTEM, by Paul S. Wilson. Jan 60, 143p. 13 refs. RADC-TR-59-107.
Order from LC mi$7.20, ph$22.80 PB 146 842

The NAVARHO Program is the most recent Air Force effort directed toward the development and evaluation of a low frequency, long distance, ground based, radio navigation system. The purpose of the development was to evolve a navigation system combining the advantages of previous systems but eliminating, insofar as possible, the disadvantages. A rhotheta technique was chosen, largely because it was believed that such geometry would provide a circular service area with uniform accuracy in all directions from the ground facility. The program included the development of both airborne receiving equipment and a ground based transmitter facility. While the accuracies required by military specifications were not fully met, it is indicated that, with certain refinements, the system would be fully adequate for worldwide, peacetime applications. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
PROCEEDINGS OF SYMPOSIUM ON DECISION THEORY AND APPLICATIONS TO ELECTRONIC EQUIPMENT DEVELOPMENT, 10-11 MAY 1960, VOLUME I. Apr 60, 146p. 38 refs. RADC TR-60-70A.
Order from LC mi$7.20, ph$22.80 PB 147 166

Contents:
Tutorial paper - An introduction to Bayes decision
The choice of estimation procedure and loss function for radar system synthesis
The decision problem in radar
A sequential multi-decision procedure
Signal detection by adaptive filters
The search and detection efficiency of surveillance and communications devices using sequential probability ratio analysis
The resolvability of point sources

Rome Air Development Center, Griffiss AFB, N. Y.
A SECURE NARROW BAND CLOSED CIRCUIT TELEVISION SYSTEM FOR MILITARY APPLICATIONS (TELEVISION COMMUNICATIONS SYSTEM AN/FXC-1), by Richard C. Benoit, Jr. and Frank Coughlin, Jr. Feb 60, 22p. 5 refs. RADC-TN-60-2; AD-232 767.
Order from LC mi$2.70, ph$4.80 PB 146 111

Television communication system AN/FXC-1 is a voice bandwidth monochrome television system capable of transmitting printed, scenic, graphic briefings and other visual data between two or more distant points. It provides full communications security when used with a standard code generator. Secure duplex audio facilities are also provided when the equipment is used with approved security devices. Transmission media are three standard toll quality voice circuits.

Sperry Gyroscope Co., Garden City, N. Y.
INSTRUCTION BOOK: REPORT ON ELECTRONIC RAY TRACER. Rept. on Contract Nonr-1819(00). Oct 57, 102p. Rept. no. 2264-8086-2
Order from LC mi$5.70, ph$16.80 PB 137 555

The Electronic Ray Tracer is a device to be used as an aid in the study of sonar wave propagation. It computes and plots a family of rays through a medium by solving an approximation of the basic differential equations which govern the propagation of waves through a medium where velocity is a function of depth only. This equipment is well adapted for rapid analysis of a transmission problem of radar and radio wave as demonstrated by the Air Force under a limited set of ambient conditions.

Stackpole Carbon Co., St. Marys, Pa.
IMPROVED CARBON BRUSHES FOR AIRCRAFT ELECTRICAL MACHINES, by Robert E. Nelson. Rept. for 1 Nov 55-1 Nov 58 on Evaluation of Carbon Brushes, Contract AF 33(600)31195. Jan 60, 102p. 4 refs. WADC Technical rept. 57-170.
Order from OTS $2.50 PB 161 760

The primary purpose of this contract was the evaluation of improved carbon brushes for use in aircraft rotating machines at 8,000 RPM from sea level to 80,000 ft. The evaluation was based on bell jar, slip ring, sea level and altitude chamber equipment test results. Specific performance checks were conducted in oil and oil vapor, in high ambient temperature, at very low and very high humidity levels, in dry nitrogen, in high vacuum, on rhodium plated, monel and copper slip rings, as well as on practical machines at sea level and in the Cornell and WADC altitude chambers. Electrical, chemical, physical, densitometer, x-ray fluoroscope, x-ray diffraction, metallograph and mass spectrometer checks were employed in material analyses.

Stanford Electronics Labs., Stanford U., Calif.
A THEORY FOR THE TRANSIENT ANALYSIS OF AVALANCHE TRANSISTOR PULSE CIRCUITS, by D. J. Hamilton. Rept. on Contract Nonr-225(24). 15 June 59, 68p. 17 refs. Technical rept. no. 1701-1; AD-218 575.
Order from LC mi$3.90, ph$10.80 PB 146 426

A simple physical theory is developed which describes the transient behavior of an avalanche transistor in terms of its physical parameters. The consideration of the minority carrier charge stored in the base during the transient process is an important factor in the development of the theory, and major emphasis is placed upon the use of charge variables in describing the model for the transistor. The theory is applied in the analysis of two classes of avalanche transistor pulse circuits: that in which the transistor is used with a capacitive load, and that in which the transistor is used with a resistive load.

Stanford Research Inst., Menlo Park, Calif.
APPLIED RESEARCH IN MICROMINIATURE FIELD EMISSION TUBES, by W. W. Hansen. Quarterly progress rept. no. 1, 1 July-1 Oct 59, on Contract DA 36-039-sc-84526. Oct 59, 26p. 2 refs. AD-231 935.
Order from LC mi$2.70, ph$4.80 PB 146 797

Research concerns a study of microminiature field emission devices which ultimately can be fabricated from thin films of refractory metals and insulators, using electron-activated machining techniques. These techniques involve the use of high resolution electron beams acting on the films in the presence of decomposable gases. Beam induced chemical reactions permit the etching or deposition of films in preselected patterns and may lead to the construction of large assemblies of interconnected electronic components of minute size. Apparatus is being designed for the study of simulated tubes containing field emission cathodes. Principal components are a demountable ultra-vacuum chamber and a micro-manipulator to produce small displacements of tube elements in three dimensions. Field plots were made with the use of an electrolytic tank, and electrode models were constructed, to estimate tube performance and to define optimum conditions of operation. Emitters, filaments, and phosphors were made and tests indicate that they are satisfactory. (Author)

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF HIGH-POWER FILTER TECHNIQUES, by E. M. T. Jones, S. B. Cohn, and E. D. Sharp. Annual rept. no. 1, 18 Feb 58-18 Feb 60, on Contract AF 30(602)1998. Mar 60, 56p. 27 refs. SRI Proj. 2797; RADC-TR-60-79.
Order from LC mi$3.60, ph$9.30 PB 147 357

A summary is presented of the status of a study program having as its objective the investigation of design techniques for UHF and microwave high-power filters. A brief account is presented of the levels of spurious radiation generated in high-power transmitters, the techniques for measuring the spurious outputs, the present Air Force specifications on tolerable interference levels, and a brief outline of some proposed and prototype high-power filters that can be used to reduce spurious outputs to tolerable levels. A summary is given of the results of a study of the reduced electric gradients within high-power filters with rounded rather than sharp corners. A number of dissipative filters are also described.

Stanford Research Inst., Menlo Park, Calif.
A LEAKY-WAVE ANTENNA WITH A CURVED APERTURE, by R. C. Honey and J. K. Shimizu. Scientific rept. no. 5 on Contract AF 19(604)3502. Feb 60, 28p. 4 refs. AFCRC-TN-60-197.
Order from LC mi$2.70, ph$4.80 PB 147 049

The design and the measured performance of a leaky-wave antenna whose radiating aperture is curved to fit flush with a 30-degree sector of a cylindrical surface are presented. The radius of curvature of the surface is about 46 inches, or 44 wavelengths at the design frequency. The aperture of this antenna is 18 inches in the E-plane with an arc length of 24 inches in the H-plane, and consists of an inductive sheet spaced over a conducting surface. The radiation patterns of this antenna were measured over the frequency range 8 to 13 kMc. At the design frequency, 11.42 kMc, the experimental results check extremely well with the theoretical predictions for a pencil beam 3.8-degrees wide in the H-plane by 3-degrees in the E-plane, tilted 55-degrees in the H-plane from the normal to the surface at the feed end of the antenna. (Author)

Stanford Research Inst., Menlo Park, Calif.
A SINUOUS FLUSH-MOUNTED FREQUENCY-INDEPENDENT ANTENNA, by J. K. Shimizu, E. M. T. Jones, and R. C. Honey. Scientific rept. 3 on Contract AF 19(604)3502. Oct 59, 27p. 8 refs. AFCRC-TN-60-126; AD-232 518.
Order from LC mi$2.70, ph$4.80 PB 146 012

The design and measured performance of a sinuous flush-mounted frequency-independent antenna are described. This antenna is an example of a class of antennas that has constant input impedance and constant pattern shape over an essentially unlimited frequency band. The pattern of the experimental printed circuit antenna is linearly polarized and has an almost constant beamwidth pattern oriented at a fixed direction in space, and operates over a frequency band limited only by the feed, extending from 3.2 to 16kMc. This antenna can easily be scaled to operate over other frequency bands, and even greater bandwidths of operation can be achieved by suitable modification of the feed design. (Author)

Stanford Electronics Labs., Stanford U., Calif.
A STUDY OF THE EMITTING-SOLE LINEAR MAGNETRON AMPLIFIER, by D. Chen. Rept. on Contract Nonr-225(24). 14 July 59, 121p. 37 refs. Technical rept. no. 207-1; AD-220 571.
Order from LC mi$6.30, ph$19.80 PB 147 099

A study of the linear emitting-sole magnetron amplifier is presented. A thick non re-entrant beam under Brillouin flow conditions, with the lower beam boundary in contact with the sole is explored. The transverse normalized susceptance of the beam, R_b, at the upper beam boundary is derived. Computations of the complex R_b as a function of the complex propagation constant, in the region of interest, for 3 typical frequencies are given. Four asymptotic forms of R_b to cover the entire complex plane of the propagation constant are derived. The wave solutions for matching the emitting-sole beam to free space and also to a conducting plate at 3 different distances above the beam are computed in detail through the use of these 4 asymptotic forms of R_b. Some discussions regarding the matching of the emitting-sole beam to a periodic circuit are given. The electronic efficiency of a reentrant-type emitting-sole beam is estimated and compared to that of a thin beam. An experimental amplifier is designed and constructed. It employs a smooth conducting plate as a circuit, facing an emitting-sole beam which fills up three-quarters of the spacing between the circuit and the sole. Results on the dc beam transmission test were satisfactory. (Author)

Sylvania Electronic Systems, Waltham, Mass.
OPTIMUM CODES STUDY, by R. Turyn. Final rept. on Contract AF 19(604)5473. 29 Jan 60, 39p. 9 refs. Rept. F437-1; AFCRC-TR-60-111.
Order from LC mi$3.00, ph$6.30 PB 146 909

This report is concerned with finding sequences whose terms are +1 or -1, or codes, and whose autocorrelation function is relatively small (except at zero). The main interest was in certain optimal codes (autocorrelation function not greater than 1 in absolute value except at zero). The main results are that no such optimum codes exist if of odd length exceeding 13. For even length, we are led to a consideration of certain periodic codes. Some important results are given on these. As a consequence, no optimum codes of even length less than 144 but greater than 4 exist. It thus seems likely no optimum codes other than those known exist. In addition, certain near-optimum codes are discussed. (Author)

Syracuse U. Research Inst., N. Y.
CHARACTERISTICS OF COUNTERWOUND HELICES, by Richard E. Gildersleeve. Task rept. no. 5 on Contract AF 30(602)1640. 15 Oct 58, 29p. 12 refs. SURI Rept. no. EE492-5810T5; RADC-TN-59-5; AD-208 287.
Order from LC mi$2.70, ph$4.80 PB 146 506

Antennas constructed of arrays of helices occupy considerable space when the standard fabrication techniques are used. If circularly polarized waves of either rotational sense are to be transmitted or detected the space requirements for the antennas more than doubles. In an attempt to reduce the space requirements to that of a single array a study was conducted to determine the feasibility of winding two helices, constructed to identical specifications except for rotational sense, coaxially and at the same distance from their common ground plane. Such a configuration of helices has been given the name "counterwound coaxial helices" or, more simply, "counterwound helices."

Syracuse U. Research Inst., N. Y.
DIAGNOSIS OF EQUIPMENT FAILURES, PART 1, by Richard A. Johnson and John D. Brule. Final rept. on Contract AF 30(602)1833. 15 Apr 60, 38p. 8 refs. SURI rept. no. EE-577-604F1; RADC-TR-60-67A.
Order from LC mi$3.00, ph$6.30 PB 146 785

A systematic method of finding efficient (near optimum) diagnostic procedures is discussed in some detail. This systematic method is based on a figure of

merit which insures that in each test of a defective equipment information is gained as inexpensively as possible. This paper summarizes the basic mathematical models and criteria for optimum procedures. Part I of this final report gives some results which indicate the effect of various maintenance procedures on the overall reliability of an equipment. In general, the maintenance procedures depend on the method of fault location (diagnosis) employed so that from this study one can compare the total effect of diagnostic procedures on the reliability of the equipment. The treatment is general in that it includes the treatment of redundant equipments.

Syracuse U. Research Inst., N. Y.
DIAGNOSIS OF EQUIPMENT FAILURES, PART 2, by Earl J. Kletsky. Final rept. on Contract AF 30(602)1833. 15 Apr 60, 82p. 2 refs. SURI rept. no. EE-577-604F2; RADC-TR-60-67B.
Order from LC mi$4.80, ph$13.80 PB 146 786

This portion of the final report deals with applications of the theoretical work. To illustrate this work a diagnostic procedure for a physical piece of electronic equipment has been prepared. A discussion of some practical matters to be considered in the application of the method are included. In addition, a computer program has been developed to establish a possible logical structure for the automatic calculation of diagnostic procedures. This program also demonstrates the feasibility of machine computation. (See also PB 146 785)

Syracuse U. Research Inst., N. Y.
A STUDY OF RECIPROCITY RELATIONSHIPS FOR GYROTROPIC MEDIA, by Alfred T. Villeneuve. Final rept. for 1 Sep 57-31 Aug 58 on Contract DA 30-115-ORD-861. 17 Sep 58, 89p. 17 refs. SURI Rept. no. EE509-589F; AD-205 708.
Order from LC mi$4.80, ph$13.80 PB 147 148

A modified reciprocity theorem is used in deriving a variational principle applicable to inhomogeneous, anisotropic media. Stationary expressions for resonant frequencies of cavities and propagation constants of waveguides are derived from this variational principle. Several examples of their use are included. A stationary expression for the electromagnetic field scattered by conducting obstacles in the presence of anisotropic media is also derived. A modified Green's function technique, applicable to anisotropic media, is discussed. The correct Green's function is that for media with tensor permeabilities and permittivities transposed.

Varian Associates, Palo Alto, Calif.
RESEARCH ON MOLECULAR AND ATOMIC RESONANCE DEVICES, by John C. Helmer. Final rept. on Contract DA 36-039-sc-73266. Dec 59, 52p. 1 ref. Engineering rept. 218-1F.
Order from LC mi$3.60, ph$9.30 PB 146 790

The goal of the solid state maser program has been to create a ferroelectrically tuned, zero field maser The crystal under study eventually proved to be unsuitable for this application, but the work itself led to a greater understanding of the ferroelectric state and of the influence of the ferroelectric state on magnetic ions within the crystal. The beam type maser program began with a study of noise in molecular beams. This was followed by a components investigation leading to design criteria for millimeter and submillimeter beam type masers. (See also PB 145 234)

Vitro Labs., West Orange, N. J.
PRODUCTION OF A SERIES OF NICKEL-CADMIUM BATTERY TESTERS, by A. W. Speyers, F. J. Keim and R. B. Naugle. Final engineering rept. for 18 Aug 55-30 Nov 58 on Contract DA 36-039-sc-64703. [1958] 72p. 2 refs. KLX-10137; AD-229 195.
Order from LC mi$4.50, ph$12.30 PB 146 788

Efforts were directed toward developing more accurate and convenient procedures and equipment for determining the state of charge of alkaline-type storage batteries and the condition of Le Clanche-type dry cells. A total of 22 battery testers of 4 different types were fabricated; the operating theory, physical description, operation, and performance of each tester type are discussed. One tester utilized the pulse discharge type of test with a maximum discharge current of 10 amp dc. A second tester was designed specifically to determine whether a BB-401/U battery coming from a trickle charge will deliver at least 75% of its rated capacity. A 10-amp discharge for 24 sec to detect imperfect cells is followed by an 84-sec pulsed charge at 5 amp. The increase of battery voltage between 20 and 84 sec of charge is used to indicate the state of charge. A third type is a multi-purpose tester designed for laboratory use; this unit incorporates a 60-sec charge, 60-sec discharge type of test with maximum pulsed charge and discharge currents of 50 amp average dc. A fourth tester was designed for use with higher capacity batteries capable of supplying discharge currents up to 1000 amp. The battery voltage drop free of ohmic voltage drop during discharge is obtained indirectly. The performance of the battery testers was generally satisfactory in indicating the condition or state of charge of batteries.

Washington U., Seattle.
FLUX CONCENTRATOR FOR HIGH-INTENSITY PULSED MAGNETIC FIELDS, by Y. B. Kim and E. D. Platner. Technical rept. on Contract Nonr-477(12). Apr 59, 40p. 13 refs.
Order from LC mi$3.00, ph$6.30 PB 146 840

Use of multiturn coil structure in the production of several hundred kilogauss pulsed fields is discussed with specific emphasis on coil life. The magnetic force that shortens the coil life is reduced by introducing a flux concentration device. Into the multiturn coil is inserted a rigid, slotted metal slug that generates induction current in such a way as to shift the magnetic flux from the multiturn to the central vacuum region and serves as a flux concentrator. Electromagnetically and mechanically this scheme is a convenient synthesis of the multiturn and single turn coils.

Westinghouse Electric Corp., Baltimore, Md.
HIGH TEMPERATURE MAGNETIC AMPLIFIERS (400 CYCLES PER SECOND). Rept. on Thermionics and Solid State Electronic Technology, Contract AF 33(616)5686. Feb 60, 121p. WADC Technical rept. 59-753.
Order from OTS $2.75 PB 161 762

Techniques and materials have been developed suitable for use in designing 400 cps magnetic amplifiers capable of satisfactory operation over an ambient temperature range of -65°C to +500°C. Amplifiers designed with these techniques and materials have the capability of withstanding temperature cycling as well as vibration at an intensity of 15 g from 70 to 2000 cps and an amplitude of 0.03 inch from 10 to 70 cps. The units may be operated at ambients of -65°C and +500°C during vibration.

Wiley Electronics Co., Phoenix, Ariz.
RESEARCH DIRECTED TOWARD THEORETICAL AND EXPERIMENTAL INVESTIGATION OF CORRECTED LINE SOURCE FEEDS, by Richard R. MacMillan and A. W. Love. Final rept. on Contract AF 19(604)5718. Feb 60, 182p. 2 refs. WER-93; AFCRC-TR-60-122.
Order from LC mi$8.40, ph$28.80 PB 147 054

This final report contains detailed design, construction, and test data on a K_a-band spherical reflector with a beamwidth of 20 minutes of arc. Problems encountered during the program, together with the engineering approach used for their solutions, are also discussed. Finally, the performance of the antenna is evaluated. (Author)

Ordnance, Missiles, and Satellite Vehicles

Army Chemical Warfare Labs., Army Chemical Center, Md.
INVESTIGATION OF YELLOW DYES FOR USE IN THE M18 COLORED-SMOKE GRENADE, by Woodrow W. Reaves, Kenneth G. Carlon, and John E. Andrews. Jan 60, 11p. CWLR-2336; AD-231 128.
Order from LC mi$2.40, ph$3.30 PB 146 862

The current standard M18 yellow-smoke grenade is unstable and hazardous to load. Production records of the U. S. Army Chemical Corps Materiel Command indicate that loading hazards result from the sensitivity of the smoke formulation, which contains auramine hydrochloride as the dye ingredient, and that operational failures have occurred after the grenades have been stored at 160°F. Previous investigation of the storage characteristics of the grenade at higher temperatures strongly indicate that the operational failures could be attributed to the instability of the dye. It was concluded that a mixture of 35±5% dibenzo[a, h] pyrene-7, 14-dione and 65±5% 7H-benz[d, e] anthracen-7-one produced a colored smoke comparable to that formed by the auramine hydrochloride formulation now in current use. The commercial dye CS2171 also produced a suitable color. (Author)

Army [Rocket and Guided] Missile Agency, Redstone Arsenal, Ala.
EPHEMERIS FOR EXPLORER IV: 1958 EPSILON, by R. M. Adams (Smithsonian Astrophysical Observatory). Issue no. 3 on Orbital Data Series. 16 Sep 58, 393p. AD-202 688.
Order from LC mi$11.10, ph$60.60 PB 147 590

Positions of Explorer IV, 1958 Epsilon at 1-min intervals from 13 August thru noon, 27 August are listed. Baker-Nunn photographs (rough reductions), minitrack, microlock, moonwatch, and a few radar observations were used in preparing the ephemeris. The ephemeris given positions of subsatellite points in geographic latitude and longitude. A subsatellite point is defined as the intersection of the radius Vector with the international ellipsoid. Thus, the heights given are the actual distances between the satellite and the subsatellite points. All longitudes given are degrees east and heights are in kilometers. Positions listed in this report are accurate to better than ±0.25°, using time as the independent variable. Heights are within an accuracy of 10 km.

Arnold Engineering Development Center [Tullahoma, Tenn.]
ANNULAR NOZZLES FOR MISSILE BASE FLOW TESTING, by C. E. Peters. Rept. on ARO, Inc., Contract AF 40(600)800. May 60, 25p. 2 refs. AEDC-TN-60-62.
Order from LC mi$2.70, ph$4.80 PB 147 330

A simplified method of designing axisymmetric annular nozzles is presented. Tabulated supersonic nozzle contours are used, and the centerbody contours are chosen to conform to stream surfaces in the nozzle flow field. Calibration data obtained from 6-in. model nozzles and from a family of .36-in. exit diameter nozzles indicate that a properly contoured centerbody has no adverse effect on flow quality. The use of annular nozzles is a feasible approach to the simulation of supersonic flow past missile model afterbodies. (Author)

Avco [Everett] Research Lab. [Mass.]
PERTURBATIONS OF A TWENTY-FOUR HOUR SATELLITE ORBIT, by Don Lautman. Rept. on Contract AF 04(647)278. Mar 59, 14p. Research rept. 43.
Order from LC mi$2.40, ph$3.30 PB 147 200

An investigation has been started to determine the orbit changes of an artificial satellite which is essentially stationary with respect to the surface of the Earth. The interest in this problem is based on the 24-hour communication satellite. The essential results contained in this paper are tabulated.

Ballistic Research Labs., Aberdeen Proving Ground, Md.
COMPILED FREE-AIR BLAST DATA ON BARE SPHERICAL PENTOLITE, by H. J. Goodman. Feb 60, 46p. 27 refs. Rept. no. 1092.
Order from LC mi$3.30, ph$7.80 PB 147 051

Free-air blast parameters (peak pressure, positive impulse and positive duration) from the detonation of

spherical 50/50 Pentolite charges fired at sea level conditions have been compiled. Analytic expressions for side-on pressure, side-on positive impulse and normally reflected impulse have been determined by fitting least squares polynomials to the data. The function for side-on pressure extends over all scaled distances where pressure might be of military importance, and is of the asymptotic form given by Krikwood and Brinkley. (Author)

Ballistic Research Lab., Aberdeen Proving Ground, Md.
ON THE ASYMPTOTIC BEHAVIOR OF CERTAIN ONE-DIMENSIONAL FLOWS, by J. H. Giese. Mar 60, 49p. 4 refs. Rept. no. 1098.
Order from LC mi$3.30, ph$7.80 PB 147 485

A theoretical aspect of the efflux of gas from a tube, open at one end, has been studied. Dr. W. C. Taylor has conjectured, loosely speaking, that regardless of the initial state of the gas, the asymptotic behavior for large t is of the known form $u(x,t) \sim f(x)/t$ and $c(x,t) \sim g(x)/t$, u and c being particle velocity and speed of sound. His conjecture was confirmed by fairly elementary means for $\gamma = 3$. Subject to an additional physically plausible monotonicity assumption, it has also been verified for the considerably harder case $\gamma = 5/3$. The latter problem was reduced eventually to determining the asymptotic behavior of the solutions of an integro-difference (or equivalently differential-difference) equation. (Author)

Beechcraft Research and Development, Inc., Boulder, Colo.
HYDROGEN-OXYGEN FUEL ELECTROLYTIC BATTERY CONTAINER STUDY, by James R. DeHaan and Marshall Piccone. Rept. on Contract AF 33(616)5833. Oct 58, 106p. 37 refs. Engineering rept. 6152; WADC Technical rept. 58-542; AD-203 521.
Order from LC mi$5.70, ph$16.80 PB 147 268

This report is a study of various methods of storing oxygen and hydrogen for use in hydrogen-oxygen fuel electrolytic cells in a zero-gravity environment, and to determine analytically the optimum storage techniques for a family of such cells. Various insulation methods were studied and their applicability to specific missions are discussed. Graphs are presented showing storage system weight as a function of duration and fuel cell power output, and watt hours of power obtainable per pound of storage system, also as a function of duration and fuel cell power output. The theoretical basis of a method of phase separation suitable for the operation of the low pressure storage systems in a weightless environment has been derived.

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
ADHESION TEST FOR GRADE C GREASEPROOF BARRIER MATERIALS, by Mario E. Gigliotti and John H. Mazzei. Apr 60, 17p. 6 refs. Technical rept. 2679.
Order from LC mi$2.40, ph$3.30 PB 145 518

Experiments demonstrated that an adhesion test of Grade C barrier materials based on the principle of sticking one specimen to another was not desirable. Results of such tests were not reproducible because the surfaces of the Grade C materials were not homogeneous (waxes were dissimilar, thread counts in the cottonscrim were inconsistent, etc.). A test was therefore developed in which a Grade C specimen was adhered to an aluminum panel and the force necessary to separate the specimen from the panel was measured measured. The use of the aluminum panel with its smooth, continuous, homogeneous surface gave reproducible results. A ranking of values obtained in the newly developed adhesion test was compared with a ranking based on the results of a personal opinion survey conducted among packaging personnel at Rossford Ordnance Depot and at Picatinny. The results of this study correlated significantly with the results of the laboratory adhesion test. It was therefore concluded that this adhesion test is completely satisfactory for specification purposes. (Author)

Feltman [Research and Engineering] Labs., Picatinny Arsenal, Dover, N. J.
ANALYSIS OF EXPLOSIVES BY INFRARED SPECTROSCOPY, by Frank Pristera, Michael Halik and others. May 56, 65p. 27 refs. Technical rept. 2254.
Order from LC mi$3.90, ph$10.80 PB 147 594

A compilation of 68 infrared spectrograms covering all common high explosive compounds and many possible explosive ingredients, additives, and related compounds has been prepared. An examination of the prepared spectrograms has made possible the empirical deduction of several new band assignments, notably 9.25 microns for the symmetrical trinitro aromatic configuration and 11.0 microns for the meta dinitro aromatic configuration. These should facilitate the infrared structural investigation of unkown ingredients such as newly synthesized compounds. Extensive detailed descriptions have been presented for the preparation and qualitative use of infrared spectrograms of the explosive ingredients. Considerable information has been presented regarding the qualitative and quantitative analyses of mixtures of explosive ingredients by infrared and/or other methods. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
THE CHEMISTRY OF HEXAMETHYLENETETRAMINE IN AN ACIDIC AQUEOUS MEDIUM, by Thomas C. Castorina, James W. McCahill and others. Apr 60, 37p. 13 refs. Technical rept. 2674.
Order from LC mi$3.00, ph$6.30 PB 144 634

The behavior of hexamethylenetetramine (Hexamine) in an acidic aqueous medium was studied from two aspects. One aspect was the decomposition of the compound to formaldehyde and ammonium ions and the influence of parameters such as concentration, acidity, and added formaldehyde on this decomposition process. The other was the exchange of methylene groups between hexamine and formaldehyde during hydrolysis equilibrium and the effect of concentration, pH, and temperature on the rate of this exchange. It was observed that the addition of formaldehyde to dilute aqueous acidic solutions of hexamine represses the hydrolysis of the material and that the degree of

repression is governed by the enhanced basicity of the hexamine-for-maldehyde solution as well as by Le Chatelier's law. The exchange of methylene groups between hexamine and formaldehyde in acid solution was studied with carbon-14 tagged reagents. The rate of exchange was observed to increase proportionately with reagent concentration, acidity, and temperature. The relationship of these results to the behavior of hexamine in the nitrolysis to HMX and RDX is discussed briefly. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
DEVELOPMENT OF TRACER FOR THE 37mm T324E22 SHELL (VIGILANTE) by Ralph B. Wright. May 60, 8p. 1 ref. Technical notes no. 45.
Order from LC mi$1.80, ph$1.80 PB 146 216

This report describes the development work on a 7-second tracer for the 37 mm T324E22 shell up to the time of acceptance by the user, the developer of the shell. For reasons of urgency, compromises had to be imposed upon this development program. As a result the subject tracer is not considered to be an optimum design. This tracer was developed empirically by varying composition, column size, and types of tracer compositions. The accepted design maintains the exterior configuration of the standard closure plug except that 1/4 inch was added to the rear face. The tracer cavity, 1/2 inch in diameter and 1 inch deep, contains R-45 type tracer composition and K-29 type igniter composition, both of which are consolidated at 100,000 psi. When tested ballistically the tracer produced results that were considered acceptable by the user. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
EFFECTS OF MAGNESIUM CONTENT CASE MATERIAL, AND CASE COATING ON BURNING CHARACTERISTICS OF A FLARE SYSTEM, by Anthony F. Taschler and Seymour M. Kaye. Apr 60, 19p. Technical notes no. 42.
Order from LC mi$2.40, ph$3.30 PB 144 829

The luminosity levels of flare systems consisting of magnesium (100/200 mesh) sodium nitrate, and Laminac 4116 increase with increasing magnesium content, up to the 70% fuel level. The burning rates of such compositions also increase with increasing magnesium content, up to the 65-66.7% fuel level, but drop when the fuel level is further increased (up to 70% in this investigation). The above findings are based on the results of evaluations of several magnesium/sodium nitrate/Laminac 4116 compositions conducted at Picatinny in tracking flare tubes of the T131 type. Various coatings - wax, Laminac, and Thiokol - were used on the tubes, and found to have no significant effect on either luminosity or burning rate. Similar evaluations of compositions FY965, FY966, FY976, and FY977 indicated that, when coarser magnesium is used, both the luminosity level and the burning rate are reduced. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
EVALUATION OF NEW SOURCES OF NITROCELLULOSE IN M8 PROPELLANT, by Vladimir Mirko. Mar 60, 15p. 9 refs. Technical rept. 2677.
Order from LC mi$2.40, ph$3.30 PB 144 828

The sources of woodpulps suitable for manufacturing nitrocellulose were increased when it was shown that nitration of a sulfate woodpulp and of a sulfite woodpulp containing 15% hardwood produced acceptable military grades of nitrocellulose. Nitrocellulose prepared from these pulps was evaluated in M8 mortar propellant as part of a broader program to determine whether such nitrocellulose is suitable for use generally in standard propellants. Accordingly, lots of 60 mm M3A1 mortar increments were prepared from M8 propellant containing the experimental lots of nitrocellulose and compared, in ballistic and physical properties, with production lots of increments containing nitrated cotton linters. It was found that the characteristics of the experimental propellants were equivalent to those of the production lots. (Author)

Feltman Research and Engineering Labs., Picatinny Arsenal, Dover, N. J.
MEAN PRESENTED AREA OF SMALL STEEL FRAGMENTS MEASURED BY MEANS OF FREE FALL IN A VISCOUS FLUID, by I. H. Stein. Oct 58, 34p. 9 refs. Technical memo. no. 127A53; AD-207 094.
Order from LC mi$3.00, ph$6.30 PB 147 152

The mean presented areas of small irregular shaped steel fragments, within and beyond the lower limit of the icosahedron gage, were measured by a new method. This technique, based upon the free fall of a fragment in a viscous fluid and the fragment weight, yields results comparable in accuracy to the icosahedron gage; an average deviation of 4.3% and a maximum deviation of 10% from true values were observed. For fragments below 30 grains, an empirical expression for presented area was determined. (Author)

[General Electric Co., Schenectady, N. Y.]
ANALYSIS OF "BOILER" LOX TANK PRESSURIZATION MEANS FOR THE HA-3B, by Henry J. Sneck and W. W. Fischer. 19 Feb 53, declassified. 14p. Proj. Hermes Heat Trans. memo. no. 73.
Order from LC mi$2.40, ph$3.30 PB 147 479

The calculated thermodynamic data are presented as a series of curves.

General Electric Co [Schenectady, N. Y.]
ANALYSIS OF FUEL TANK PRESSURIZATION MEANS FOR THE HA-3B, by W. W. Fischer and Nancy Fitzroy. 28 Apr 53, 15p. Proj. Hermes Heat Trans memo. no. 83.
Order from LC mi$2.40, ph$3.30 PB 146 892

General Electric Co., Schenectady, N. Y.
ANALYSIS OF OXIDIZER TANK PRESSURE FROM END OF LOX EXPULSION TO IMPACT, HERMES A-3B, by W. W. Fischer. 12 Aug 53, 7p. Proj. Hermes Heat Transfer memo. no. 75.
Order from LC mi$1.80, ph$1.80 PB 146 881

General Electric Co. [Schenectady, N. Y.]
BATTERY BOX TEMPERATURE ESTIMATES FOR HA-3A ROUNDS 5 THROUGH 8, by Glen E. McIntosh. 6 Feb 53, 6p. 1 ref. Proj. Hermes Heat Trans. memo. no. 71.
Order from LC mi$1.80, ph$1.80 PB 147 477

[General Electric Co., Schenectady, N. Y.]
COOLING OF FIN SERVO MOTORS FOR HERMES A-3A, ROUNDS 5 THROUGH 8, by Edward C. Archinal and David J. Masson. 26 May 53, 3p. 3 refs. Proj. Hermes Heat Trans memo. no. 80B.
Order from LC mi$1.80, ph$1.80 PB 146 889

[General Electric Co., Schenectady, N. Y.]
COOLING OF 225 INCH-OUNCE DUNCAN-BAYLEY MAGNETIC CLUTCH, by David J. Masson. 22 Oct 52, 3p. Proj. Hermes Heat Transfer memo. no. 57.
Order from LC mi$1.80, ph$1.80 PB 145 986

General Electric Co. [Schenectady, N. Y.]
DESIGN ANALYSIS OF A LOX BUGGY PRESSURIZATION SYSTEM, by Glen E. McIntosh. 5 May 53, 4p. 4 refs. Proj. Hermes Heat Transfer memo. no. 84.
Order from LC mi$1.80, ph$1.80 PB 146 893

[General Electric Co., Schenectady, N. Y.]
ESTIMATION OF HEAT LOSS FROM HA-3A FIN SHIPPING CONTAINER WHEN USED AS A OVEN, by W. W. Fischer. 28 Oct 52, 1p. Proj. Hermes Heat Transfer memo. no. 58.
Order from LC mi$1.80, ph$1.80 PB 145 987

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF OXIDIZER TANK PRESSURES FROM CUTOFF TO END OF LOX EXPULSION, HERMES A-3B, HERMES A-3A, AND FLIP-FLOP TEST, by Nancy Fitzroy and W. W. Fischer. 22 May 53, 23p. Proj. Hermes Heat Transfer memo. no. 74.
Order from LC mi$2.70, ph$4.80 PB 146 880

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF TEMPERATURE DISTRIBUTION IN DEFLECTOR SKIRT, HA-3A, by W. W. Fischer. 19 Feb 53, 5p. Proj. Hermes Heat Trans memo. no. 78.
Order from LC mi$1.80, ph$1.80 PB 146 884

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF TEMPERATURE VARIATION OF TELEMETRY EQUIPMENT IN FORE AND AFT COMPARTMENTS DURING FLIGHT. HA-3A ROUNDS #5 - #8, by W. D. Breingan and W. W. Fischer. 31 Oct 52, declassified. 5p. 3 refs. Proj. Hermes Heat Transfer memo. no. 61.
Order from LC mi$1.80, ph$1.80 PB 145 990

General Electric Co. [Schenectady, N. Y.]
ESTIMATION OF TEMPERATURES OF THE SHAPED CHARGE USED FOR EMERGENCY FLIGHT INTERRUPTION, RV-A-10, by David J. Masson. 13 Nov 52, 1p. Proj. Hermes Heat Trans. memo. no. 64.
Order from LC mi$1.80, ph$1.80 PB 147 468

Conservative estimations of the time constant for the shaped charge show that its temperature during flight should not exceed 170°F when insulated as described by the manufacturer. The temperature of the shaped charge would probably exceed the safe working temperature during flight if ample provisions for thermal insulation were not provided.

General Electric Co. [Schenectady, N. Y.]
LOAD TESTS OF FIN SERVO MOTORS AND CLUTCHES UNDER OPERATING CONDITIONS, by Edward C. Archinal and Glen E. McIntosh. 6 May 53, 11p. Proj. Hermes Heat Transfer memo. no. 80A.
Order from LC mi$2.40, ph$3.30 PB 146 888

General Electric Co. [Schenectady, N. Y.]
PRELIMINARY ESTIMATE OF COOLING REQUIREMENT OF HYDRAULIC PACKAGE SERVO, by David J. Masson. 3 Dec 52, 4p. 3 refs. Proj. Hermes Heat Transfer memo. no. 68.
Order from LC mi$1.80, ph$1.80 PB 147 472

General Electric Co. [Schenectady, N. Y.]
TEMPERATURE-ALTITUDE TEST OF AUTOPILOT FOR HA-3A ROUNDS 1 THROUGH 4, by Robert W. Ottaway and Glen E. McIntosh. 13 Nov 52, 2p. Proj. Hermes Heat Transfer memo. no. 60.
Order from LC mi$1.80, ph$1.80 PB 145 989

General Electric Co. [Schenectady, N. Y.]
TEMPERATURE-ALTITUDE TEST OF HA-3A INVERTER FOR ROUNDS 9 ONWARD, by Robert W. Ottaway and Glen E. McIntosh. 19 Nov 52, 3p. Proj. Hermes Heat Transfer memo. no. 66.
Order from LC mi$1.80, ph$1.80 PB 147 470

General Electric Co. [Schenectady, N. Y.]
TEMPERATURE-LOAD TESTS OF FIN SERVO MOTORS FOR HA-3A, ROUNDS 1 THROUGH 8, by Edward C. Archinal and Glen E. McIntosh. 2 Apr 53, 11p. Proj. Hermes Heat Trans memo. no. 80.
Order from LC mi$2.40, ph$3.30 PB 146 887

[General Electric Co., Schenectady, N. Y.]
TEMPERATURE PREDICTION FOR THE AFT HEAD OF THE THINNED HA-2 118" MOTOR BODY, by Allen E. Galson and W. W. Fischer. 13 Sep 52, declassified. 8p. Proj. Hermes Heat Transfer memo. no. 47.
Order from LC mi$1.80, ph$1.80 PB 145 983

[General Electric Co., Schenectady, N. Y.]
TEMPERATURE PREDICTION FOR THE 31" HA-2 TEST MOTOR WITH 1/4" THICK DIVERGENT SECTION, by Allen E. Galson and William W. Fischer. 27 Aug 52, declassified. 9p. 3 refs. Proj. Hermes Heat Transfer memo. no. 45.
Order from LC mi$1.80, ph$1.80 PB 145 981

General Electric Co. [Schenectady, N. Y.]
TEMPERATURE-RESISTANCE TESTS OF 1N63 AND 1N43 GERMANIUM DIODES, by Glen E. McIntosh. 10 Feb 53, 3p. 2 refs. Proj. Hermes Heat Trans memo. no. 76.
Order from LC mi$1.80, ph$1.80 PB 146 882

[General Electric Co., Schenectady, N. Y.]
TEMPERATURE TEST OF BALLAST RESISTOR UNIT, by Robert W. Ottaway and Glen E. McIntosh. 14 Oct 52, 2p. 3 refs. Proj. Hermes Heat Transfer memo. no. 54.
Order from LC mi$1.80, ph$1.80 PB 145 985

General Electric Co. [Schenectady, N. Y.]
TESTS OF A LIQUID COOLING SYSTEM FOR THE HA-3B AUTOPILOT, by Edward C. Archinal and Glen E. McInotsh. 6 May 53, 2p. Proj. Hermes Heat Trans memo. no. 85.
Order from LC mi$1.80, ph$1.80 PB 146 894

General Electric Co. [Schenectady, N. Y.]
THERMAL CHARACTERISTICS OF GENERAL ELECTRIC MAGNETIC CLUTCH FOR FIN SERVO MECHANISM, by David J. Masson. 11 Mar 53, 5p. Proj. Hermes Heat Trans memo. no. 79.
Order from LC mi$1.80, ph$1.80 PB 146 885

General Electric Co. [Schenectady, N. Y.]
THERMAL CHARACTERISTICS OF GENERAL ELECTRIC MAGNETIC CLUTCH FOR FIN SERVO MECHANISM, by David J. Masson. 14 Apr 53, 3p. Proj. Hermes Heat Trans memo. no. 79A.
Order from LC mi$1.80, ph$1.80 PB 146 886

General Electric Co. [Schenectady, N. Y.]
THERMAL EFFECT OF STIFFENING LOX-ALCOHOL TANK BULKHEAD AND OXIDIZER TANK VENT, by Helen C. Bass and W. W. Fischer. 20 May 53, 2p. Proj. Hermes Heat Transfer memo. no. 86.
Order from LC mi$1.80, ph$1.80 PB 146 895

[General Electric Co., Schenectady, N. Y.]
THERMAL TEST OF BALLAST RESISTOR BOX FOR HA-3A ROUNDS 5 THROUGH 8, by Glen E. McIntosh. 16 Apr 53, 2p. 1 ref. Proj. Hermes Heat Trans memo. no. 82.
Order from LC mi$1.80, ph$1.80 PB 146 891

General Electric Co. [Schenectady, N. Y.]
THERMAL TESTS OF SUBMINIATURE TUBE MOUNTS, by Robert W. Ottaway and Glen E. McIntosh. 13 Feb 53, 5p. Proj. Hermes Heat Trans memo. no. 77.
Order from LC mi$1.80, ph$1.80 PB 146 883

General Electric Co. [Schenectady, N. Y.]
PRELIMINARY ESTIMATION OF FIN ANTENNA TEMPERATURES, HA-3A, by W. W. Fischer. 8 Apr 53, 1p. 1 ref. Proj. Hermes Heat Trans memo. no. 81.
Order from LC mi$1.80, ph$1.80 PB 146 890

General Electric Co. [Schenectady, N. Y.]
PREDICTION OF NECESSARY COOLING OF THE DIGITAL COMPUTER SYSTEM, HA-3, by R. T. Lancet and W. W. Fischer. 12 Jan 53, 27p. 6 refs. Proj. Hermes Heat Transfer memo. no. 59.
Order from LC mi$2.70, ph$4.80 PB 145 988

Naval Ordnance Test Station, China Lake, Calif.
A GEODETIC COORDINATE SYSTEM FOR ASKANIA CINETHEODOLITES, by R. J. Stirton. 1 Feb 60, 36p. 3 refs. NOTS TP-2427; NAVORD rept. 7038.
Order from LC mi$3.00, ph$6.30 PB 147 124

It is proposed to use a geodetic coordinate system (geodetic latitude and longitude, and elevation above sea level) to describe positions of Askania cinetheodolites. For small ranges of say 20 miles extent a plane-grid coordinate system is satisfactory, but if the range is extended to some hundreds of miles or if several ranges are used in conjunction it appears more practical to use geodetic coordinates for cinetheodolite positions. Cinetheodolites measure azimuth and elevation angles with respect to the north and the local vertical. Synthesis of cinetheodolite observations to a position or trajectory requires that the positions of the cinetheodolites and the azimuth and elevation angles be transformed to some common reference frame. The common reference frame used here may be either a geocentric system or a topocentric system centered at a cinetheodolite station or other convenient point on the earth. The necessary transformations for bringing the azimuth and elevation and the cinetheodolite positions into the common coordinate system are developed in detail.

Naval Ordnance Test Station, China Lake, Calif.
A METHOD FOR TESTING MISSILE COMPONENTS IN A CONTROLLED ENVIRONMENT OF HIGH-INTENSITY SOUND, by Eldon Sparrow. 11 Feb 57, 15p. NOTS 1677; NAVORD rept. 5418.
Order from LC mi$2.40, ph$3.30 PB 147 009

High-intensity acoustic noise (intensity greater than 100 db) produced by a missile's propulsion unit can be detrimental to electronic components in the missile and hence result in greatly reduced reliability. To ascertain whether or not the noise level would affect sensitive relays in a particular missile's control unit, the characteristics of the sound from the propulsion unit were recorded and reproduced at the

appropriate intensity, and the relays were subjected to this effect within a closed chamber approximating the control section of the missile. The relays were unaffected and their use was justified. The test setup for this study is described in detail, and a brief report is made on the hazards experienced in working with high-intensity sound. (Author)

Naval Ordnance Test Station, China Lake, Calif.
TECHNIQUES FOR THE STATISTICAL ANALYSIS OF CINETHEODOLITE DATA, by R. C. Davis. 22 Mar 51, declassified 2 Oct 54, 24p. 6 refs. NOTS 369; NAVORD rept. 1299.
Order from LC mi$2.70, ph$4.80 PB 147 269

The problem of obtaining an estimate of missile position from an overdetermined system of cinetheodolite observations subject to error is formulated as a problem in the now classical theory of least squares. Previous methods of data reduction based on the minimization of certain quadratic forms cannot be formulated statistically within the framework of the theory of least squares. Moreover, if the cinetheodolite angles are normally distributed, the least squares estimate obtained coincides with the maximum likelihood estimate of missile position. From the ensemble of angular observations it is possible to obtain unbiased estimates of the terms appearing in the variance-covariance matrix of the three coordinates of missile position. A criterion for the optimum location of cinetheodolite stations is developed. Several illustrative examples of the general theory are given. In particular, the examples of the application of the criterion for the optimum location of stations prove that slant ranges as well as angles of intersections are important. (Author)

Naval Ordnance Test Station, China Lake, Calif.
TELEMETRY FACILITIES AT NOTS GROUND RANGES. 1 Jan 59, 13p. NOTS TP-2203; AD-218 196.
Order from LC mi$2.40, ph$3.30 PB 146 976

Office of Defense Research and Engineering, Washington, D. C.
TECHNICAL RESOURCES DIRECTORY: MISSILE GROUND SUPPORT EQUIPMENT, NO. 2. 1 May 60.
Order from OTS $0.50 PB 161 535

Through its extensive research and engineering programs, the Department of Defense is developing material and equipment designed to meet present and future military requirements. The diverse tasks embraced in these programs range throughout the broad scope of military activities. This directory of military technical resources is intended to encourage communication in the Military Departments and in industry in the area of ground support equipment for missile systems. (Supersedes issue no. 1, 1 Nov 59, PB 161 103)

Pacific Missile Range, Point Mugu, Calif.
PAY LOAD LOSS FOR EQUATORIAL ORBITS DUE TO NON-EQUATORIAL LAUNCHES, by M. M. L. Eaton and M. A. Garcia. 29 July 59, 85p. 3 refs. Technical memo. no. PMR-TM-59-4.
Order from LC mi$4.80, ph$13.80 PB 147 384

In addition to the latitude of the launch site, five key parameters are involved in the calculations. These are: fuel specific impulse, rocket structural factor, altitude of desired orbit, range to apogee of preliminary rocket trajectory, and ratio of the apogee to the circular velocity. Of the two models analyzed the apogee transfer is generally preferable to the circular orbit transfer case. (See also PB 147 383)

Pacific Missile Range, Point Mugu, Calif.
PAY LOAD LOSS FOR EQUATORIAL ORBITS DUE TO NON-EQUATORIAL LAUNCHES, by Max L. Eaton and Manuel A. Garcia. 2 Apr 59, 16p. Pub. no. PMR-MP-59-13.
Order from LC mi$2.40, ph$3.30 PB 147 383

This report estimates a penalty for producing equatorial satellite orbits from launch sites off the equator. The penalty concerns the decrease in pay load compared to launches from the equator. Two methods of obtaining an equatorial orbit from a non-equatorial launch site have been considered; namely, "apogee transfer" and "orbital transfer."

Rock Island Arsenal Lab., Ill.
ALUMINUM ALLOYS FOR RECOIL MECHANISM CYLINDERS, by F. Blessin. 17 Mar 60, 26p. 9 refs. Rept. no. 60-798.
Order from LC mi$2.70, ph$4.80 PB 146 906

Wear and friction tests were conducted with currently used recoil mechanism packing materials sliding on steel and high strength aluminum alloys. It was found that the aluminum alloys were less compatible with the packing materials than was the steel now used for recoil mechanism cylinders. Weight and expansion due to internal pressure were calculated for aluminum cylinders equal in strength to steel cylinders at a temperature of 300F. It was found that no savings in weight would be obtained by the use of aluminum and that expansion of aluminum cylinders would be greater than that of steel cylinders. (Author)

Springfield Armory, Mass.
BASIC SYSTEMS CONCERNING SLIDE ENERGY OF OPEN-SYSTEM, GAS-OPERATED WEAPONS, by F. M. Chakour. Rept. on Design Studies and Evaluation for Weapons and Related Materiel for Ground Roles. 26 Feb 59, 44p. SA-TR20-9000.
Order from LC mi$3.30, ph$7.80 PB 146 837

A study was made in order to determine the relationship of available slide energy to the following parameters: orifice location, orifice diameter, initial cylinder volume, piston diameter, piston stroke, weights of recoiling parts. A test fixture was used to obtain experimental data. Correlation of these data was made. Procedure is described, and results discussed. (Author)

Springfield Armory, Mass.
A DETERMINATION OF THE DISTRIBUTION OF CHROMIUM PLATE IN THE BORES OF SMALL ARMS BARRELS, by M. S. Spivak. Rept. edited by Associated Engineers, Inc., on Contract DA 19-020-

504-ORD-4800. 12 Feb 60, 14p. Rept. SA-TR18-1070.
Order from LC mi$2.40, ph$3.30 PB 147 281

Barrels of various calibers were chromium plated, sectioned, and the chromium thickness was measured at the lands and grooves. Graphs were plotted of groove chromium thickness versus land chromium thickness for the various barrels.

Stanford Research Inst., Menlo Park, Calif.
FUNDAMENTAL INVESTIGATION OF ROCKET SLED SLIPPER WEAR, by T. D. Witherly. Rept. on Contract N123(60530s)4591A. Nov 59, 58p. 6 refs. NOTS TP 2381; NAVORD rept. 7018.
Order from LC mi$3.60, ph$9.30 PB 146 758

The basic mechanisms of high-speed wear, friction, and lubrication of rubbing surfaces were studied under conditions simulating those at the interface between the rails of a rocket test track and the shoes which support the rocket sled. Comparative wear data were obtained for eight slide materials at nominal bearing pressures ranging from 150 to 1,590 psi, and at sustained velocities of 1,100 to 1,200 fps. Test distances ranged from 1,500 to 10,600 ft of track. (Author)

University of Southern California. Engineering Center, Los Angeles.
INTERACTIONS OF RAPIDLY MOVING BODIES IN TERRESTRIAL ATMOSPHERE, by K. P. Chopra. Technical note on Contract AF 18(603)95. 31 Mar 60, 153p. 103 refs. USCEC rept. 56-212; AFOSR-TN-60-398.
Order from LC mi$7.50, ph$24.30 PB 147 300

The phenomena concerning the interactions of rapidly moving bodies in an ionized medium pervaded by a magnetic field are described in this report. This study has a special bearing on the motion of artificial earth satellites. The various phenomena are divided into four classes. The first category of phenomena concerns the interaction of the body with neutral particles. These phenomena form a part of the area called 'aerodynamics' and the recent theoretical work in this particular area is reviewed in Chapter II. The second group of phenomena deals with the generation of electrical currents induced in the moving body or the surrounding medium (or both) by the relative motion of the conducting material and the magnetic field. The third class of phenomena is due to the body's acquiring an electric charge due to the accretion of charged particles and the photo-electric effect of the solar radiation, and the consequent Coulomb interactions between the charged body and the charged particles. This class of phenomena forms the subject matter for Chapters III and IV. The motion of the charged body in the terrestrial atmosphere is capable of exciting various wave phenomena. Three kinds of waves are described: plasma oscillations in the wake of the body (Kraus-Watson), extraordinary electromagnetic waves (Chopra-Singer), and magneto-hydrodynamic waves due to the interaction between the induced motion of an ionized column ahead of the body and the transverse component of the terrestrial magnetic field. These wave mechanisms are discussed in Chapter VI. Chapter VII reviews the theoretical studies contained in Chapters II through VI, and the pertinent observational material on the upper atmosphere observed by the artificial earth satellites.

Watertown Arsenal Labs., Mass.
CRACK DEPTH LEAKAGE FLUX CHARACTERISTICS IN FERROMAGNETIC MATERIALS, by Patrick C. McEleney. Apr 60, 47p. 9 refs. Technical rept. no. WAL TR 148.1/1.
Order from OTS $1.25 PB 161 513

Specimens of six fired gun tubes of varied chemistry and heat treatment, with simulated cracks, were examined with a magnetic recording borescope to determine the minimum magnetization level for adequate sensitivity in crack detection. Little improvement in sensitivity is realized by magnetization levels above 1600 ampere turns and no improvement in scatter of data over that of previous data was noted. (Author)

Sanitation and Safety Engineering

Arctic Aeromedical Lab., Ladd AFB, Alaska.
COLD WEATHER TESTS ON PNEUMATIC SHELTER RAFT, (MFG. BY AIR CRUISERS, DIVISION OF GARRETT CORP.), by Harold L. Donley. July 57, 13p. Technical note AAL-TN-57-18.
Order from LC mi$2.40, ph$3.30 PB 147 289

Cold weather habitational suitability tests were conducted on the global shelter-raft, pneumatic, 20-man, under arctic and subarctic conditions. The objectives of the cold weather tests were to determine its suitability as (1) an emergency cold weather shelter for downed airmen; (2) an aerial delivered global item of rescue equipment; (3) an emergency para-rescue shelter; (4) and a temporary shelter for persons doing isolated work in the Arctic.

Arctic Aeromedical Lab., Ladd AFB, Alaska.
TESTING AN INCINERATOR TOILET FOR GROUND USE, by Lester Baribo. Apr 57, 11p. Technical note AAL-TN-57-6.
Order from LC mi$2.40, ph$3.30 PB 147 288

Army Engineer Research and Development Labs., Fort Belvoir, Va.
USE OF CORPS OF ENGINEERS MOBILE WATER PURIFICATION UNIT AND AUXILIARY PROCESSES FOR DESTROYING BACTERIAL SPORES IN COLD WATER, by Paul B. Pruett and Don C. Lindsten. Rept. for Jan-Feb 55. 29 Jan 59, 47p. 3 refs. Rept. 1564-TR; AD-213 126.
Order from LC mi$3.30, ph$7.80 PB 146 246

A series of field experiments were conducted at Camp A.P. Hill, Virginia, to investigate methods of destroying chlorine-resistant bacterial spores when added to a cold surface water supply. Non-pathogenic Bacillus subtilis var. niger was used as the test organism. A field method of superchlorination (100 ppm), acidification to a pH value of less than 7.0, dechlorination with 600 ppm activated carbon followed by normal treatment with the Army's Mobile Water Purification Unit, was found satisfactory for destruction of the bacterial spores. The tests showed that the following treatment methods were ineffective: (1) superchlorination (100

ppm), chlorine-contact period (95 min), and pH greater than 8.5; (2) coagulation and diatomite filtration without chlorination in the Mobile Water Purification Unit; (3) prechlorination (1.0 ppm) and diatomite filtration without coagulation in the Mobile Water Purification Unit; (4) prechlorination (1.0 ppm), coagulation, and diatomite filtration with the Army's Mobile Water Purification Unit; and (5) preheating water from 40° to 97°F, prechlorination to 1.0 ppm, coagulation, and diatomite filtration. (Author)

Ship Building

Bureau of Ships, Washington, D. C.
SHOP PRACTICE SUGGESTIONS. [1959] 31p.
Order from OTS $0.50 PB 161 715

These are employee suggestions that were of sufficient importance to be published in the Bureau of Ships Journal for the benefit of all Bureau of Ships facilities and employees.

Bureau of Yards and Docks, Washington, D. C.
DRYDOCKING FACILITIES. VOLUME 3. DATA BOOK. 1 Feb 55, 284p. Technical Pub. NAVDOCKS TP-Pw-10.
Order from OTS $4.00 PB 161 744

This publication, issued in three volumes, presents the current policies, practices, criteria, and technical data used by military and civilian personnel concerned with the Navy's drydocking facilities. Volume 3 presents technical data in summary form on the principal characteristics and features of existing facilities. (See also PB 151 759)

David Taylor Model Basin, Washington, D. C.
COMPARATIVE RESISTANCE DATA FOR FOUR PLANING BOAT DESIGNS, by Eugene P. Clement and Peter M. Kimon. Jan 57, 27p. 2 refs. Rept. no. 1113.
Order from LC mi$2.70, ph$4.80 PB 146 946

Four existing models of planing craft were retested at the Taylor Model Basin's "standard condition" for planing boat models. The test results for each model are presented in a design data sheet. The data are compared to show the effects of differences in hull form. These comparisons are independent of differences in hull loading, in LCG location, or in size of boat. Auxiliary graphs are included to assist in making estimates of speed and power for new designs. (Author)

Naval Civil Engineering Lab., Port Hueneme, Calif.
DYNAMIC TESTS OF ALUMINUM BEAMS, by J. R. Allgood and S. K. Takahashi. Final rept. 22 Mar 60, 28p. 5 refs. Technical rept. 078.
Order from LC mi$2.70, ph$4.80 PB 147 117

Three built-up 5456-H311 aluminum alloy beams, with a clear span length of 8 ft 1-3/8 in. and restrained ends, were subjected to uniformly distributed static and dynamic loading. One of the members, tested statically to a 21.6 psi sustained load, buckled at the web. The other two members, subjected to blast loads with peak overpressures of 18.2 psi and 18.5 psi, also buckled at the web. Results are given, dynamic response of the members is discussed, and a design criterion based on a limit deflection of L/50 is proposed. According to the suggested criterion, the alloy and section used have inferior blast load resistance. (Author)

FOOD, HANDLING, AND PACKAGING EQUIPMENT

Office of Technical Services, Dept. of Commerce, Washington, D. C.
FOOD PRESERVATION BY IRRADIATION (SUPPLEMENT TO CTR-357). Mar 60, 5p. 57 refs. OTS Selective Bibliography 403.
Order from OTS $0.10 OTS SB-403

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

National Bureau of Standards, Washington, D. C.
DETERMINATION OF A GENERAL INDEX OF EFFORT IN SORTING MAIL BY CONVENTIONAL METHODS, by Seymour Henig. June 60, 9p. 1 ref. Technical note 54.
Order from OTS $0.50 PB 161 555

The conventional method of sorting letters in stages is described. It is shown, through reference to available statistics, that about 90% of letters originating within the areas served by several large post offices will be involved in no more than five stages to be completely sorted to a carrier, firm or section of boxes. A method is presented for the accounting of each stage's individual letter readings which are defined as the units of measurement for the index of sorting effort. It is found that the upper bound average number of readings per letter for three large post offices varies from 3.16 to 2.98 and that these bounds are applicable to 96.2 to 92.4% of the local originating first class letters. It is anticipated that the values of such indexes for all large post offices will be consistently close to the range already determined. (Author)

National Bureau of Standards, Washington, D. C.
MAGNETIC DRUM DIRECTORY AND PROGRAMMING SYSTEM FOR CODESORTING LETTER MAIL, by Peter C. Tosini. June 60, 51p. 2 refs. Technical note 50.
Order from OTS $1.75 PB 151 409

The purposes of this report are: (1) to examine the major concepts involved in designing a magnetic drum directory and programming system for coded-address sorting ("codesorting") letter mail in general; and (2) to develop these through modifications and extensions

to accommodate local and outgoing sorting for the Washington, D.C. Post Office in particular. It is restricted to one distributor separating local mail to carriers and "directs" (destinations receiving large volumes of mail), and outgoing mail to cities and "state residues" (alphabetic ranges of cities within a state). The specialized problems encountered in multi machine and multi-pass sorting, sorting to carrier walk, and sorting to time-varying destinations are not discussed.

Stanford Electronics Labs., Stanford U., Calif.
A DYNAMICALLY-ADJUSTABLE CHUCK MOUNTING FOR CENTERING WORK IN A GLASSBLOWING LATHE, by H. A. Meneses and M. D. Hare. Rept. on Contract DA 36-039-sc-73178. 17 Oct 58, 13p. Technical rept. no. 453-2.
Order from LC mi$2.40, ph$3.30 PB 137 915

This report describes a mechanism which fits between the spindle and chuck of a glassblowing lathe and permits centering the work by lateral motion of the chuck with the lathe in operation. It also allows the work to be offset by a small measured amount. (Author)

Engines and Propulsion Systems

Aeronautical Engine Lab., Naval Air Material Center, Philadelphia, Pa.
HIGH TEMPERATURE BEARING LUBRICATION WITH ADDITIVE FUELS, by A. Lockwood. Phase 1 rept. on Project TED-NAM-PP5206. 18 Jan 57, 23p. NAMC-AEL-1487; AD-121 959.
Order from LC mi$2.70, ph$4.80 PB 146 503

A method of providing lubrication for gas turbine engine bearings at operating temperatures up to 650°F is under investigation. This method utilizes as a lubricant JP-5 fuel (for cooling purposes) containing test additives (for lubrication purposes). The additives tested were tricresyl phosphate, dibenzylsulphide and molybdenum disulphide. Satisfactory bearing operation at a no-load and 650°F operating condition was obtained with the use of the tricresyl phosphate additive. (Author)

Air Force Office of Scientific Research, Washington, D. C.
AFOSR CONTRACTORS' MEETING [NO. 3] ON ION AND PLASMA PROPULSION MARCH 22-24, 1960. Co-sponsored by Republic Aviation Corp. [1960] 49p. 8 refs. AFOSR-TN-60-405.
Order from LC mi$3.30, ph$7.80 PB 146 900

Contents: Electromagnetic pinch research; Preliminary design of an integrated space vehicle propulsion system; Ion propulsion at Rocketdyne; Charged colloid pro pulsion; Surface emission of positive ions; Micron size particles for electric propulsion; Compact charge ionization; Heavy particle propulsion; Ion in rocket combustion; Heat transfer from arc heated gases; Electromagnetic plasma propulsion studies; Design studies on the XE-701 ion engine; Investigation of ion thrust devices; Initial ionization process in gases; Small plasma jet propulsors; Hi intensity plasma jets; Acceleration in channeling of plasma jets by magnetic fields; Pulsed plasma propulsion; Aerodynamic applications of plasma wind tunnels; Studies on propulsion of plasma; Plasma acceleration by non-uniform RF fields; Crossed field acceleration of ions and plasmas; Injection into a linear plasma accelerator; High temperature MHD experiments; Realization of magnetohydrodynamic propulsion; Continuous magnetic acceleration of arc plasma; Low temperature plasma jet; Thermophysical properties of magnetohydrodynamic plasmas; Magnetohydrodynamic waves; Gasdynamics of plasma; Bounday layers in plasma accelerators; Heat transfer from an ionized gas to a gaseous coolant; C_8 solid propellant; Properties of ions in flames; Ion rocket sputtering and neutralization studies.

Bureau of Yards and Docks, Washington, D. C.
POWER GENERATION AND DISTRIBUTION. CHAPTER 5. INTERNAL COMBUSTION ENGINES; MAINTENANCE AND OPERATION. 15 Dec 53, 64p. 7 refs. Technical Pub. NAVDOCKS TP-Pu-3.
Order from OTS $1.75 PB 161 743

Chapter 5 deals with stationary internal combustion engines for power purposes. It gives operating instructions; measures for preventive maintenance, including inspection, safety precautions, and trouble shooting; and the log for performance and maintenance data. Fuel and lubricants are discussed, as well as fuel, lubricating, cooling, and starting systems. (See also PB 161 358)

Kennametal, Inc., Latrobe, Pa.
RESEARCH ON TITANIUM CARBIDE TURBINE WHEELS AND FABRICATION OF TWO SLOTTED SPIN TEST WHEELS. Final rept. on Contract Nonr-1680(00). 22 June 59, 15p. AD-220 566.
Order from LC mi$2.40, ph$3.30 PB 146 477

The fabrication of 2 spin test turbine wheels of TiC composition is described. One wheel was of K164B composition throughout, and the other was a composite wheel with K164B at the hub and K162B at the rim containing the blade sections. Ball-milled powders were packed in rubber envelopes, shaped approximately to the over-all shape of the finished part, and hydrostatically pressed with the large explosive pressing chamber. The pressure was about 35,000 psi. The slugs were presintered, machined, sintered, and ground to final dimensions, with adjustments in dimensions to obtain static balance. The composite wheel was made by forming and sintering the hub and rim sections separately, grinding, and furnace welding them together.

Little, Arthur D., Inc., Cambridge, Mass.
ALKALI METALS AS PROPELLANTS, by Alfred Buchler and Joan Berkowitz. Final rept. for 29 Apr 58-31 Aug 59 on Energy Transfer Research, Contract AF 29(600)1625. Nov 59, 99p. 143 refs. AFMDC-TR-59-40.
Order from LC mi$5.40, ph$15.30 PB 146 011

The available thermodynamic data for gaseous LiF, NaF, LiCl, NaCl, Li_2O, LiOH, NaOH, and their

dimers, are critically discussed and tables of thermodynamic functions based on these data are given. There appears to be no advantage in the use of alkali metal solutions or dispersions as propellants.

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
THE STUDY OF THE ORIGIN AND PROPAGATION OF DISTURBANCES IN THE BURNING OF SOLID PROPELLANTS, by G. A. Agoston. Summary rept. for 1 Feb 59-1 Feb 60 on Contract AF 49(638)565. 17 Feb 60, 28p. 33 refs. SRI Proj. GU-2770; AFOSR-TN-60-336.
Order from LC mi$2.70, ph$4.80 PB 147 312

A program has been undertaken to study the behavior of shock waves in the region of steep temperature gradients close to a burning solid propellant surface. The objective is to reveal underlying mechanisms which play significant roles in solid propellant combustion instability. Attempts have been made to observe photographically the behavior of a shock wave near a burning solid propellant surface, near a burning monopropellant (liquid ethyl nitrate) surface and in the region of a flat ethylene-air flame. The photographs obtained with solid propellants are not revealing. Much more readily interpretable pictures were obtained with the ethyl nitrate and the ethylene-air flames. The schlieren photographs obtained of shock waves introduced in a direction parallel to the surface illustrate the distortion and stretching of the shock wave which occurs. Further tests are recommended to reveal the various effects which may occur and to serve as a basis for a proposed theoretical analysis of the phenomena. (Author)

Machine Parts and Mechanisms

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
THE EFFECTS OF NUT MATERIALS AND LUBRICANTS ON THE SEIZING AND CALLING CHARACTERISTICS OF TITANIUM BOLT THREADS, by Joseph Viglione. 6 Dec 56, 56p. 1 ref. Project TED NAM AE 6244.3; NAMC-AML-AE-1023; AD-127 166.
Order from LC mi$3.60, ph$9.30 PB 146 502

The effects were determined of various lubricants and surface treatments on the seizing and galling characteristics of titanium bolts assembled with titanium alloy, stainless steel, and aluminum alloy nuts. The relaxation characteristics of 1/4" titanium alloy bolts compared quite favorably with those of similar steel bolts, even at extremely high loads approaching the yield strength.

Naval Engineering Experiment Station, Annapolis, Md.
FRICTION TESTS OF TEFLON BEARING MATERIAL, by W. J. Kommers. 7 June 57, 15p. Research and Development rept. 090017A; AD-206 939.
Order from LC mi$2.40, ph$3.30 PB 147 034

The frictional characteristics of presently used stern tube and strut bearing materials are compared with samples of Teflon impregnated glass cloth laminates. The other materials include phenolic impregnated cotton cloth laminates (plain and with MoS_2) and lignum vitae wood. Static and kinetic sliding friction tests were made under dry and water lubricated conditions, and all bearing samples were tested against both bronze and Monel journal specimens. The tests are limited because of the small size of the Teflon samples provided. The coefficients of friction of the Teflon samples were lower than those of the other materials under the dry running tests and the static tests. With water lubrication, all materials had approximately the same kinetic friction coefficients. Investigations of the abrasive wear resistance and the cold flow characteristics of Teflon are recommended prior to making simulated bearing performance tests. (Author)

Office of Technical Services, Washington, D. C.
BEARINGS 1945-1960. Apr 60, 17p. 294 refs. OTS Selective Bibliography SB-410.
Order from OTS $0.10 OTS SB-410

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. Reports on bearings are arranged in sections as follows: gas lubricated; journal; roller; friction, anti-friction, and ball; bearings, general (includes jewel, sleeve, and thrust bearings).

Manufacturing Equipment and Processes

American Machine and Foundry Co., Chicago, Ill.
STUDY OF THE APPLICATION OF AUTOMATION TECHNIQUES AND EQUIPMENT TO THE MANUFACTURE OF PRECISION LENSES, by J. Des Jardins, H. Ishima and others. Final rept. for Sep 58-Apr 59 on Contract DA 36-034-507-ORD-153. 15 June 59, 155p. MR-1090; AD-220 101.
Order from LC mi$7.50, ph$24.30 PB 146 879

This report summarizes the work completed in a feasibility study to determine how, and to what degree the production methods, processes, and equipment now used in the manufacture of precision lenses (spherical lenses only) for fire control material at Frankford Arsenal Optical Shop can be improved, changed, and supplemented through the application of automation techniques and/or equipment. (Author)

Armour Research Foundation, Chicago, Ill.
BERYLLIUM RESEARCH FOR DEVELOPMENT IN THE AREA OF CASTING, by Frank A. Crossley, Arthur G. Metcalfe, and William H. Graft. Rept. for 15 June 58-14 Oct 59 on Solid State Research and Properties of Matter, Contract AF 33(616)5911. Feb 60, 102p. 33 refs. WADC Technical rept. 59-500....
Order from OTS $2.50 PB 161 754

Various aspects of the casting of beryllium have been investigated: (1) X-ray determination of the direction of columnar growth in cast beryllium; (2) consumable arc melting; (3) reported allotropy by thermal analysis; (4) grain-refining inoculants; and (5) application of vibration to cast beryllium for grain refinement A very pronounced thermal arrest was found 5 to 10°C below the solidification temperature. Also, transformation markings were observed metallographically. No preferred orientation of columnar grains was found. Consumable arc-melting experiments showed grain size from 316 grains/in^2 to 616 grains/in^2. Rust-colored tantalum nitride, WC, and TiB_2 apparently nucleated beryllium solidification to produce grain refinement. Also, an alloying addition of 1 at. % Ge produced grain refinement. (Author)

Office of Technical Services, Dept. of Commerce, Washington, D. C.
WELDING (SUPPLEMENT TO CTR'S 324-331). Mar 60, 14p. 272p. OTS Selective Bibliography 402.
Order from OTS $0.10 OTS SB-402

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. The information is arranged in groupings of PB reports, AEC reports, and translations under sections titled welding techniques, equipment, metals and alloys, and evaluation methods. Government-owned inventions available for license and reviews of foreign monographes comprise other sections.

Transport, Traction and Hoist Facilities

Land Locomotion Lab., Ordnance Tank-Automotive Command, Center Line, Mich.
DRAG COEFFICIENTS OF LOCOMOTION OVER VISCOUS SOILS, PART II, by R. S. Rowe (Duke U.) and Ervin Hegedus. July 59, 32p. 4 refs. Rept. no. 54.
Order from LC mi$3.00, ph$6.30 PB 146 774

A supersaturated viscous mud overlaying a hard bottom material is often critical to locomotion in many areas. To solve the problem of a wheel or track, the familiar concepts of hydro-dynamics pertaining to incompressible viscous fluids may be applied. A correlation between theory and experiment is indicated. The basic problem to be solved is one of viscous flow around a partially submerged object. The variation in pressure resulting from the friction drag causes a bulldozing effect in front of the wheel, and a resulting wake at the back part of the wheel. The pressure drag may be reduced by streamlining the wheel which reduces both the amplitude of the pressure wave and the width of the wake behind the wheel. A comparison between various wheel forms has been made and presented in chart form. A study of the correlation between the boundary layer theory and wheels in viscous fluids is suggested. Contrary to accepted practice the usual boundary layer theory seems to apply to a viscous fluid flowing around a partially submerged object when a turbulent wake is formed. It is further suggested that a series of tests be made with muds of various viscosities and wheel forms to correlate the boundary layer thickness and the pressure distribution in the flow field surrounding the wheel as well as an attempt to solve the Navier-Stokes equations. (Author) (See also PB 134 553)

Midwest Applied Science Corp., Lafayette, Ind.
ON THE BEHAVIOR OF A LINEAR TWO DEGREE OF FREEDOM VEHICLE MOVING WITH CONSTANT VELOCITY ON A TRACK WHOSE CONTOUR IS A STATIONARY RANDOM PROCESS, by J. L. Bogdanoff and Frank Kozin. Rept. no. 2 on Contract DA[33-008]-ORD-1738. July 59, 30p. Rept. no. 59-8; Land Locomotion Lab. Rept. no. 56.
Order from LC mi$2.70, ph$4.80 PB 147 003

This study on the behavior of a linear two degree of freedom vehicle is an extension of the one degree of freedom analysis obtained in Land Locomotion Laboratory Report No. 48 (PB 144 233). Equations 3 & 4 are the general equations of motion for the vehicle. These are simplified in equations 5 & 6 for a symmetrical vehicle. Expressions 13 represent the four relations that must be identical for a model to properly simulate the motion of a prototype. Equations 20 & 21 are the steady state solutions of the vehicle equations of motion for a given random imput. Equations 34 & 35 indicate what time must pass before the steady state solution has reasonable accuracy. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
SPECIAL-PURPOSE VEHICLES: DESIGN FOR MOBILE SYSTEMS, by George Schmidt. Apr 60, 38p. 1 ref. RADC-TR-60-60.
Order from LC mi$3.00, ph$6.30 PB 147 524

The design of special-purpose vehicles employed in mobile systems for military ground-support applications is discussed. Design factors are listed and the more important of these are discussed in detail. Two mobile systems typifying different design concepts are described in order to illustrate specific design problems and to compare World War II approaches with current approaches used to solve these problems. (Author)

MATERIALS

[Aerial] Reconnaissance Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
THE EFFECTS OF NUCLEAR RADIATION UPON PHOTOGRAPHIC FILM, by James S. Moser. Preliminary rept. Jan 53, 9p. 2 refs. Technical note WCLF-53-1.
Order from LC mi$1.80, ph$1.80 PB 147 581

This Laboratory has had for some time the problem of determining the protection required for photographic film in a field of nuclear radiation. This report is a summary of the problem and of the work that has been done.

Aeronautical Chart and Information Center, St. Louis, Mo.
MEASUREMENT OF INK AND PRINTING QUALITIES, by Otto C. Stoessel, Jr. Mar 60, 26p. Technical rept. no. 90.
Order from OTS $0.75 PB 161 664

A means is presented here to list and measure various qualities necessary to implement statistical quality control relative to lithographic printing. This includes consideration of printing qualities from the viewpoint of the purchaser of printed matter who has the responsibility of quality standards and from the viewpoint of the lithographic printer who must establish and maintain qualities in consideration of the requirements given him. It further takes into consideration two basic categories; measurement of base material, i.e., paper, ink, and measurement of printed material, i.e., human, mechanical, and general process of applying the raw material. Special attention is given to establishing standards and measurements which are common to both the purchaser and printer. (Author)

Illinois Inst. of Tech., Chicago.
AN INVESTIGATION ON THE DYNAMIC PROPERTIES OF PLASTICS AND RUBBER-LIKE MATERIALS, by R. A. Eubanks, D. Muster, and E. G. Volterra. Technical rept. no. 1 on Contract N7onr-32911. 14 June 52, 125p. 20 refs. AD-307.
Order from LC mi$6.30, ph$19.80 PB 147 013

Analysis of the results of dynamic tests on a natural rubber of 27 to 30 durometer hardness indicated that the phenomena were essentially viscous and that the rubber displayed only slight hereditary effects. Formulas for the rubber specimens tested and a summary of their physical properties are given in an appendix.

Industrial Test Lab., Philadelphia Naval Shipyard, Pa.
DEVELOPMENT OF IMPROVED MATERIALS AND DESIGN FOR BERTH BOTTOMS (BIAS-CUT CANVAS) by H. A. Kline and E. H. Wadlinger. Dec 56, 32p. 9 refs. Development rept. no. 2268; AD-117 448.
Order from LC mi$3.00, ph$6.30 PB 146 504

Berth bottoms made of bias-cut cotton canvas for pipe-frame berths abroad Navy vessels have been found much sturdier and more durable in simulated service tests than the berth bottoms of No. 4 medium texture canvas now specified in Military Specification MIL-B-3715A. Breakdown of the bias bottoms required hundreds of impacts sufficiently violent to cause failure of No. 4 canvas bottoms on first impact. A proposed specification for a bias canvas berth bottom is included in the report. (Authors)

Inland Testing Labs. [Morton Grove, Ill.]
UNIFORM DUPLICATION OF ENVIRONMENTAL TEST RESULTS. PART III. EVALUATION TEST PROGRAM, by Paul Gottfried, Chester G. Polak, and John McGee. Final rept. on Contract AF 33(616)5413. Nov 58, 92. WADC Technical rept. 58-613, Pt. III; AD-205 772.
Order from LC mi$5.40, ph$15.30 PB 146 954

The results of the evaluation test program were analyzed to determine the validity and applicability of the proposed environmental test procedures to accomplish the objective of the contract, which specifically was to develop uniformity and repeatability of the environment test conditions for the assurance of uniform test results regardless of where or when the tests are performed. From the analysis of the test results, it was determined that the repeatability of the environmental test conditions could be improved by: (1) control of the test parameters and associated tolerances, and (2) clarification of the test procedures to assure uniformity in the testing process, as incorporated in the proposed specification revisions detailed in the Part II report. (See also PB 146 573)

Adhesives and Sealants

Borden Chemical Co., Philadelphia, Pa.
DEVELOPMENT OF A DURABLE ASSEMBLY GLUE FOR WOOD FURNITURE, by G. Kitazawa, M. Peters and others. Final rept. for 3 Apr 57-15 Oct 58 on Contract DA 19-129-qm-902. [1958] 44p. AD-219 385.
Order from LC mi$3.30, ph$7.80 PB 146 896

A laboratory study was conducted in the development of a durable furniture assembly adhesive. The general objectives of the development were that the adhesive be as resistant to moisture changes as the durable resin adhesives and have the application and quick set properties of animal glues. The requirements of a durable assembly adhesive have been partly met. The durability to moisture of the prepared adhesive is better than animal glue. However, the speed-of-set or curing rate is below that of the present non-durable assembly adhesives but probably satisfactory for many assembly applications. Further, it was not possible within the contract period to reduce the consistency to the desired level and to eliminate stringiness. The developed adhesive consists of a tackifier for quick set, a slow curing resinous adhesive for durability, and a separately packaged catalyst. (Author)

Feltman [Research and Engineering] Labs., Picatinny Arsenal, Dover, N. J.
IMPACT STRENGTH OF ADHESIVES AS AFFECTED BY GEOMETRY OF JOINT, by Salvatore Stivala. Feb 58, 8p. Technical notes no. 18; AD-157 635.
Order from LC mi$1.80, ph$1.80 PB 147 133

An investigation was conducted to discover what effect, if any, the shape of an adhesive joint has on its impact resistance. Two distinct phases were studied: (1) geometrically different joints having the same bonding areas, and (2) geometrically similar joints having different bonding areas. The geometrical shapes of the cold-rolled steel specimens included circular, semicircular, square, and rectangular configurations. The impact tests were conducted at 73.5°F and 50% relative humidity in accordance with Spec. MMM-A-175. The adhesive used was prepared from 100 parts Epon 828 mixed with 10 parts diethylene triamine. Curing was conducted at room temperature for 24 hr followed by 4 hr at 85°C. Results showed that circular adhesive joints tend to be more resistant to impact than semicircular adhesive joints of the same bonded area. Rec-

tangular adhesive joints of the same area which were arranged differently showed identical impact resistance. Rectangular adhesive joints of increased bonded area showed a tendency to have increased impact strength, calculated in terms of energy required to rupture per unit bond area.

Material Lab., New York Naval Shipyard, Brooklyn.
REPORT OF INVESTIGATION TO DETERMINE THE LIMITING CONDITIONS OF TEMPERATURE AND HUMIDITY FOR APPLICATION OF "COLD BOND" SHAFT COVERING MATERIALS. Final rept. 13 Mar 58, 12p. 7 refs. Lab. Project 5745-1; AD-205 699.
Order from LC mi$2.40, ph$3.30 PB 147 370

An investigation was made to determine the limiting atmospheric conditions (temperature and relative humidity) under which a "cold bond" shaft covering may be applied. These conditions were determined on the basis of conformity of the covering with the adhesion requirements of Specification MIL-S-15058D. Conformity of adhesion with the specification requirements was obtained at 44°F and 78% relative humidity only when the substrate was heated prior to and during coating application. At 74°F adhesion was satisfactory only when the sheet material was solvent cleaned and scrubbed with a wire brush. (Author)

Office of Technical Services, Dept. of Commerce, Washington, D. C.
ADHESIVES (SUPPLEMENT TO CTR-300). Apr 60, 8p. 98 refs. OTS Selective Bibliography 406.
Order from OTS $0.10 OTS SB-406

A bibliography of reports listed in the two OTS monthly abstract journals: U.S. Government Research Reports and Technical Translations.

Ceramics and Refractories

Bell Aircraft Corp., Buffalo, N. Y.
MECHANICAL PROPERTIES OF SELECTED ALLOYS AT ELEVATED TEMPERATURES. PART II. DESIGN CRITERIA OF SILICON CARBIDE, by Harry A. Pearl, John M. Nowak, and Harry G. Deban. Rept. for July 58-Sep 59 on Materials Application, Contract AF 33(616)5760. Mar 60, 134p. 38 refs. WADC Technical rept. 59-702, Pt. 2.
Order from OTS $2.75 PB 161 723

A study was made of nondestructively testing silicon carbide by density uniformity, dynamic modulus by sonic technique, X-ray diffraction under transverse load, electrical resistivity, and internal friction. Dynamic modulus of silicon carbide was experimentally determined at 80 F and 2200 F. Modulus of rupture tests were conducted at 80 F, 2200 F and 2400 F. The variability of the properties of the silicon carbide and the lack of simple correlations between the properties and geometry require the use of a statistical approach to correlate mechanical properties and geometry. A theoretical analysis is presented on the effect of specimen size, surface finish, and methods of loading on the strength properties of silicon carbide. Available literature and manufacturer's property data for various types and forms of commercially available silicon carbide are tabulated. Various areas of possible application of silicon carbide in aircraft and missiles and design parameters for leading edge applications are given. (Author)

Bell Aircraft Corp., Buffalo, N. Y.
REFRACTORY INORGANIC MATERIALS FOR STRUCTURAL APPLICATIONS, by Harry A. Pearl, John M. Nowak, and others. Rept. for June 58-June 59 on Ceramic and Cermet Materials, Contract AF 33(616)5930. Feb 60, 151p. 24 refs. WADC Technical rept. 59-432.
Order from OTS $2.75 PB 161 737

Thirty-five refractory inorganic material systems were evaluated in exploring possible techniques to prepare refractory inorganic materials into high temperature aircraft structural elements. The fabrication techniques were evaluated by the results of room temperature modulus of rupture, impact and thermal shock tests. The best over-all Bell Aircraft system was based on .003" alumina-silica paper impregnated with alumina-silica cement. Specimens of this system were tested at elevated temperature (2000 F) for modulus of rupture, compressive strength and compressive shear. A state of the art survey on foamed ceramics was also conducted as part of this study. (Author)

Minerals Research Lab., U. of California, Berkeley.
DUCTILE CERAMICS, by E. R. Parker, J. A. Pask and L. Himmel. Final rept. on Contract AF 49(638)56. Feb 60, 8p. 7 refs. Series no. 109, issue no. 3; AFOSR-TR-60-26.
Order from LC mi$1.80, ph$1.80 PB 146 841

A brief summary of research work accomplished and reports prepared on the ductility of some ceramic single crystalline materials.

Naval Research Lab., Washington, D. C.
EFFECT OF RADIATION UPON CERAMIC-BONDED STRAIN GAGES, by N. J. Rendler and R. C. Smith. Interim rept. 20 Apr 60, 18p. 1 ref. NRL rept. 5450.
Order from OTS $0.50 PB 161 307

The study of the effect of nuclear radiation upon ceramic-bonded strain gages indicates that strain gages must be radiation compensated in a manner analogous to temperature compensation. Electrical resistance of gage elements varies with reactor power, exhibiting both a partial recovery and a permanent damage effect. The radiation-resistance characteristic of gages can be matched, thus extending the promise that with proper compensation the gages will operate satisfactorily as transducers in a nuclear environment. Instrumentation should include provision for a dry, noncorrosive atmosphere and monitoring of insulation resistance. (Author)

Stanford Research Inst., Menlo Park, Calif.
SYNTHESIS OF NEW HIGH TEMPERATURE MATERIALS, by J. L. Engelke, F. A. Halden, and E. P. Farley. Rept. for June 58-June 59 on Ceramic and Cermet Materials, Contract AF 33(616)5888. Feb 60, 44p. 24 refs. WADC Technical rept. 59-654.
Order from OTS $1.25 PB 161 720

A number of mixed transition metal carbides, borides, and nitrides were prepared and examined in terms of melting point, structure, and oxidation resistance. None of the measured melting points was higher than the value reported for HfC°4TaC (3940°C). The melting point for a series of solid solutions between HfC and HbC increased regularly with hafnium content. A material with the composition Mo_2 BC, when heated in an air stream, was found to lose weight rapidly without loss of metallic character, suggesting its possible use as an ablation material. A cubic modification of hafnia was obtained in material sprayed from a plasma arc. A low coefficient of thermal expansion and high melting temperature makes this a material of interest. An implosive-shock technique for compound synthesis, which subjects materials to extremely high temperature-pressure conditions for short periods of time, was developed. The method was used successfully to synthesize boron phosphide. (Author)

Fuels, Lubricants, and Hydraulic Fluids

Instituto Nacional de Tecnica Aeronautica Esteban Terradas (Spain).
COMBUSTION OF SPRAYS IN AN OXIDIZING ATMOSPHERE, by Gregorio Millan, Segismundo Sanz, and Ignacio Da Riva. Rept. on International Congress on Combustion Engines no. 5, 1959, Contract AF 61(514)734C. [1959] 38p. 24 refs. AFOSR-TN-59-818; AD-225 647.
Order from LC mi$3.00, ph$6.30 PB 147 142

The mathematic representation of the statistical size distribution of droplets injected into the combustion chamber of Diesel engine and a gas turbine, is discussed. After consideration is given to some of the distributions proposed by other Technical Sciences (Meteorology - Gravimetrology, etc), the Mugele Evans [Ind. Eng. Chem. 43:1317-1324, 1951] distribution is selected as the most adequate for the problem. The combustion of a spray under ideal conditions is analyzed. It is assumed for it that each droplet burns in accordance with a theoretical law whose validity has been experimentally verified for a few simple cases--isolated droplets at rest or in motion, set of droplets in motion whose relative positions remain invariable, etc. The particular cases considered are the following: combustion at the beginning and end of the injection. Combustion at an instant sufficiently far in time from both the above cases. Combustion of a volume injected instantaneously as approximately occurs in a Diesel engine and, finally, superposition of isolated successive injections. The scaling of atomizers and combustion chambers is analyzed. (Author)

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
A PRESSURE BOMB FOR THE PHOTOGRAPHY OF BURNING STRANDS OF SOLID PROPELLANT, by David R. Margetts and Benjamin V. Connor. Rept. on Contract DA 04-495-ORD-18. 25 July 58, 25p. 8 refs. Rept. no. 20-119; AD-205 357.
Order from LC mi$2.70, ph$4.80 PB 147 390

A pressure bomb and associated control circuitry has been constructed for the photography of burning strands of solid propellant. The system enables high-speed black and white and color photographs of strands, ranging from 0.15 to 0.35 in. in diameter, to be take at pressures from atmospheric to 2000 psi. Different propellants were photographed. The bomb system and techniques described are capable of yielding useful data on burning surface detail, flame structure, and propellant burning instability over a wide range of propellant luminosity and burning rates.

Naval Propellant Plant, Indian Head, Md.
TALIANI TESTS FOR ASSESSMENT OF STABILITY OF SOLID PROPELLANTS, by Carl Boyars, Kermit Atlas and others. 20 Nov 58, 31p. 8 refs. Technical rept. no. 106; NAVORD rept. no. 5688.
Order from LC mi$3.00, ph$6.30 PB 138 271

The nitrogen Taliani test provides a method for determining the gassing rate of a propellant at a particular temperature and yields information about the nature of the decomposition taking place within the propellant when diffusion of atmospheric oxygen into the propellant is not significant. The oxygen Taliani test, however, can be used for estimating the residual safe storage life of propellants based on nitrate esters, and also for indicating the relative affinity of stabilizers for nitrogen dioxide and the efficiency of antioxidants in composite systems. Both manual- and automatic-recording apparatuses, as modified at the Naval Propellant Plant, are described in detail. (Author)

Ordnance Fuels and Lubricants Research Lab., Southwest Research Inst., San Antonio, Tex.
CORRELATION OF A CLR TEST PROCEDURE WITH THE CRC FL-2 TEST TECHNIQUE, PRELIMINARY STUDIES FOR, by John V. Moffitt. Preliminary studies on Contract DA 23-072-ORD-1144. June 58, 78p. 1 ref.
Order from LC mi$4.50, ph$12.30 PB 138 267

A cursory study was made to investigate use of the CLR engine for low-duty tests comparable to FL-2 and EX-3 procedures. A Chevrolet engine was used to provide data for comparison with CLR results. The CLR engine produced heavier sludge deposits under EX-3 cyclic conditions than under constant FL-2 conditions. CLR correlation with the Chevrolet EX-3 technique was also better. On the other hand, the relatively large thermal inertia of the CLR engine caused prolonged temperature stabilization periods during cycle changes, thus making the EX-3 technique less attractive from an operational standpoint. It is tentatively concluded that either type of technique could be developed for the CLR engine. (Author)

Princeton U., N. J.
FURTHER STUDIES ON THE LIGHT SCATTERING TECHNIQUE FOR DETERMINATION OF SIZE DISTRIBUTIONS IN BURNING SPRAYS. II. WIDE RANGE PHOTOGRAPHIC PHOTOMETRY, by R. A. Dobbins. Technical rept. on Contract AF 18(600)1527. 10 Feb 60, 55p. 15 refs. Aeronautical Engineering Lab. rept. no. 498; AFOSR-TN-60-353.
Order from LC mi$3.60, ph$9.30 PB 146 902

The quantitative measurement by photographic photometry of the angular variation of luminous intensity due to a group of suitably illuminated particles is discussed. Methods of developing a photosensitive film to a high degree of uniformity are shown to depend upon the effectiveness of the mixing of the developing solution and the disruption of the formation of a concentration boundary layer. By careful selection of developing technique and by use of film and microphotometer calibration procedures based on a primary standard of measurement, it was found possible to extend the useful range of a film for photometric purposes to a density of over 2.5. These methods permit the use of photographic photometry to make measurements of irradiance varying over a wide range with good accuracy. Preliminary results indicate that a range of over 100 to one can be achieved with an accuracy of better than 10% over the entire range. Photographic instrumentation applied to the measurement of a diffraction pattern yielded results which were at least as good as electronic photometry with a photomultiplier as a transducer. (Author) (See also PB 143 022)

Leather and Textiles

Cook Research Labs., Morton Grove, Ill.
ANALYSIS OF WEBBING IMPACT DATA AND DETERMINATION OF OPTIMUM INSTRUMENTATION TO BE USED IN CONJUNCTION WITH THE IMPACTING OF WEBBING, by R. B. Williams and R. J. Benjamin. Rept. for May-Sep 59 on Air Force Textile Materials, Contract AF 33(616)6440. Mar 60, 71p. 5 refs. WADC Technical rept. 59-694.
Order from OTS $2.00 PB 161 756

The basic aims of this investigation are: (1) to evaluate and analyze the methods used to obtain data acquired during nylon webbing impact tests conducted at Edwards Air Force Base, California; (2) to interpret these data and to judge their reliability; and (3) to recommend, if necessary, improved or modified testing methods and instrumentation techniques which would result in obtaining data of greater value in future tests. Analysis and interpretation of the test data indicated that these data were of intermediate reliability. Certain trends were apparent, but relatively large experimental scatter existed. Possible causes of the scatter were investigated and recommendations were made for improvement of testing methods, equipment, data reduction technique, and data interpretation. (Author)

Manchester Coll. of Science and Technology (Gt. Brit.)
TENSILE PROPERTIES OF TWISTED SINGLE FIBRES, by R. W. Dent and J. W. S. Hearle. Final technical rept. for Oct 58-Oct 59 on Contract DA 19-591-EUC-931. 30 Oct 59, 146p. 55 refs. AD-233 181.
Order from LC mi$7.20, ph$22.80 PB 146 833

It has been shown that increasing the twist in single fibres or monofilaments causes the tenacity at break and the breaking extension to decrease more rapidly at higher twists, and this decrease appears to be similar for all fibres. Two types of twisting have been used: at constant tension, and at constant length. A connection between the two is suggested. The parameters of pure torsional rupture have been considered and compared with the values obtained by Koch [Textil-Rundschau 3:111; 6:199 and 281]. The effect of the various arbitrary experimental constants has been investigated and related to the work of Breuer and others [Kunstseide u. Zellwolle 202 and 242, 1939]. Snarling in constant tension twisting has been considered. A mathematical treatment of the results is given and a criterion for the fracture of a single fibre or monofilament under combined stresses is suggested. Photomicrographs of the fibres under various combinations of stress are included. (Author)

Textile Research Inst., Princeton, N. J.
LOAD-DEFORMATION BEHAVIOR OF ELASTIC FILAMENTS WITH ARBITRARY INITIAL CONFIGURATION, by Ricardo Chicurel. Technical rept. no. 19 on Contracts Nonr-(09000, 09001). June 59, 154p. 30 refs.
Order from LC mi$7.50, ph$24.30 PB 146 509

The relation between load and deformation for an elastic filament whose axis is an arbitrary curve is examined. The type of loading which is emphasized consists of forces and moments at the ends but some cases of distributed loadings along the length of the filament are also considered. The analysis is divided in two parts: The first discusses filaments whose axes lie in one plane. The effects of bending and direct tension are included but that of shear is ignored. The second part of the analysis concerns itself with filaments whose axes are curves in space. Only bending and twisting effects are considered. (Author)

Textile Research Inst., Princeton, N. J.
THERMAL CHARACTERISTICS OF COATED TEXTILE FABRICS, by Irvin M. Gottlieb, John C. Whitwell and others. Summary rept. no. 2 for 23 Apr 57-30 June 58 on Contract N140(132)57442B. 1 July 58, 129p. 13 refs.
Order from LC mi$6.30, ph$19.80 PB 137 782

Prototype coated fabric systems were prepared in the laboratory in order to study the interactions at high temperatures of three fabrics (cotton, nylon and Orlon) and of three elastomer coatings (butyl rubber, Hypalon and neoprene). In a statistical program of testing and analysis, loss in weight, flammability,

melting and differential thermal data were obtained so as to determine those factors which contributed significantly to the high temperature fabric-coating interactions. The magnitudes of the effects of temperature, coating and fabric type, and method of application on the thermal stability of the coated fabric systems were quantitatively estimated. Significant differences were found in the thermal response, melting and flammability characteristics of the three fabrics and of the three coatings. Marked departures were noted in the thermal behavior of the coated fabric systems from that predicted from the behavior of their components. The high temperature characteristics of eighteen natural, synthetic, regenerated, and derivative fiber types of different chemical composition, and of blends of these fibers with cotton were determined. A broad spectrum of flammability and thermal stability values was obtained. The thermal behavior of the blends (measured by loss in weight), their flammability (measured by minimum temperature for ignition), and their melting characteristics differed from those anticipated from the behavior of their components. The formation of a bead due to the melting of the synthetic fibers was eliminated in the blends with cotton. (Author)

Paints and Finishes

Aeronautical Materials Lab., Naval Air Material Center, Philadelphia, Pa.
STUDIES OF ORGANIC COATINGS EXPOSED TO GAMMA RADIATION, by Jack Ohr. Partial rept. on Proj. TED NAM AE 42204. 2 July 59, 18p. 4 refs. Rept. no. NAMC-AML-AE 1089; AD-225 022.
Order from LC mi$2.40, ph$3.30 PB 147 218

Twenty experimental and specification aircraft coating systems were exposed to 1.2 mev gamma radiation. Periodic examinations were made for changes in color and film properties. Many coating systems show significant degradation changes in color and film properties after exposures of only 8.0×10^7 roentgens. The radiation stability of the various coatings is explained in terms of polymer structure and chemical groupings. (Author)

Battelle Memorial Inst., Columbus, Ohio.
CHEMICAL SURFACE TREATMENT OF TITANIUM, by H. A. Pray, P. D. Miller, and Richard A. Jefferys. Final rept. on Contract DA 33-019-ORD-215. 30 Oct 53, 33p. WAL 401/45-33.
Order from LC mi$3.00, ph$6.30 PB 147 158

Development of two types of baths that produce adherent, continuous coatings on titanium and its alloys; a 5 per cent sodium hydroxide anodic bath and the fluoride-phosphate and the fluoride-borate immersion baths. The coatings minimize greatly the severe galling tendency of titanium. Certain treatments produced coatings that provided good service for various types of reciprocating and rotary wear. These treatments involved coating the titanium in an immersion bath to produce an adherent, continuous crystalline coating, followed by (1) a heat treatment in air at about 800 F for 3 hours or by (2) application of a MoS_2-Epon resin mixture. The wear resistance is comparable to that for carbonized or nitrided surfaces which require high-temperature treatments, resulting in damage to the core properties.

Naval Civil Engineering Lab., Port Hueneme, Calif.
DECK COATING TESTS, by W. R. Nehlsen. 15 Dec 58, 12p. Technical rept. R-020.
Order from LC mi$2.40, ph$3.30 PB 138 265

A coating made with cement powder, boiled linseed oil, and lead naphthenate dryer was proposed as a superior protective coating for deck surfaces. Tests were made using this coating and a similar formula with pumice replacing the cement powder. The effectiveness of the coatings in providing adhesive, nonslip, wear resistant and corrosion resistant qualities was tested; and the standard Navy paint coating was judged to be superior.

Plastics

Aerojet-General Corp., Azusa, Calif.
A STUDY OF THE KINETICS OF SOLID-PHASE REACTIONS, by D. L. Armstrong. Technical status rept. no. 8, 16 June-15 Sep 58, on Contract AF 18(603)74. 15 Sep 58, 7p. 3 refs. Rept. no. 1282-8 (Quarterly).
Order from LC mi$1.80, ph$1.80 PB 137 819

Rates of linear pyrolysis of ammonium chloride were obtained. In general, the rate data are consistent with the isothermal vacuum-sublimation data of Spingler and Fehl, and fit the rate equation $B = 120 \exp(-13500/RT_s)$ cm/sec. It is apparent that strand loading force is an important parameter in extending the rate data to high gasification rates. Polymethylmethacrylate samples were synthesized in preparation for further investigation of the mechanism of surface decomposition of this polymer. (Author)
(See also PB 144 571)

Army Prosthetics Research Lab., Washington, D. C.
POROUS EPOXY LAMINATE EVALUATION. PART VII. EFFECT OF CURING TIME ON LAMINATE PROPERTIES, by James T. Hill and William C. Wiedmann. [1959] 6p. Rept. no. TR-5928; AD-216 382.
Order from LC mi$1.80, ph$1.80 PB 147 026

The impact resistance like bearing and compressive strength is controlled by effective porosity rather than curing conditions over the range tested. As a result of these tests it is concluded that the laminates may be completely cured at a temperature of 70°C or higher after a minimum precure of 60 minutes. The best conditions for curing, taking into affect effect porosity and physical properties, appear to be 70°C for 120 minutes. Longer or higher temperatures tend to cause discoloration of the laminates.

Office of Technical Services, Dept. of Commerce, Washington, D. C.
PLASTICS-POLYMER RESEARCH (FIVE YEAR BIBLIOGRAPHY). Oct 59, 27p. 504 refs. OTS Selective Bibliography 400.
Order from OTS $0.10 OTS SB-400

A bibliography of reports listed in the two OTS monthly abstract journals: U.S. Government Research Reports and Technical Translations. The information is arranged in groupings of PB reports, AEC reports, and translations under the following sections, which are intended as rough guides only: acrylics; cellulosics; fluoroplastics; phenolics; polyesters, polyurethanes, epoxides; polyethylenes; polystyrene; silicon-base; vinyls; adhesives; coatings and impregnants; fibers and textiles; foams, sealants, interlayers; laminates; radiation effects; general and miscellaneous. While synthetic rubber research has not been included, a few reports have been listed; these are either in borderline or overlapping areas or of sufficient pertinence or interest for inclusion. A large number of plastic reports involve several categories and in some instances two or more categories have received almost equal attention. Many polyethylene-base plastics, for example, have been placed under polyethylene. Numerous monomeric studies have been grouped with the nearest polymer.

Springfield Armory, Mass.
INTERACTION OF PLASTICS WITH VOLATILE CORROSION INHIBITORS: THIRD AND FINAL PARTIAL, by R. L. Keleher and A. Hitchins. Partial rept. no. 3 (Final) 12 Apr 57, 20p. SA-TR20-2309; AD-141 810.
Order from LC mi$2.40, ph$3.30 PB 146 992

The interaction of six thermo-plastic materials with four volatile corrosion inhibitor formulations qualified under MIL-P-3420 was observed over a nine-month period. Plastic samples were wrapped with VCI paper, enclosed in heat-sealed MIL-B-131 barrier envelopes, and exposed at 100°F and 95 percent relative humidity. Examinations showed that "CODE NL" and "CODE BH-3" were not affected by any of the four inhibitors. The other plastics tested were adversely affected to varying degrees. Delamination of the vinyl film of the barrier material was caused by two of the VCI's. (Author)

Victory Plastics Co., Hudson, Mass.
INVESTIGATION OF MATERIALS AND METHODS OF OBTAINING SUITABLE SURFACE COATING FOR GLASS FIBER REINFORCED PLASTIC STOCKS. Final summary rept. on Contract DA 19-020-ORD-3794. May 58, 66p. AD-160 047.
Order from LC mi$3.90, ph$10.80 PB 147 021

An investigation was made of materials and methods for obtaining optimum surface properties on glass fiber reinforced plastic stocks. Results of the investigation demonstrated that by the proper application of suitable materials, improvements are realized in low temperature impact properties, abrasion resistance, appearance and gripping qualities. At the same time, satisfactory resistance to weathering, heat at 250°F, water, oils, gasoline, and trichlorethylene was maintained.

Wood and Paper

Naval Civil Engineering Lab., Port Hueneme, Calif.
HARBOR SCREENING TESTS OF MARINE BORER INHIBITORS, II, by Harry Hochman and Thorndyke Roe, Jr. Interim rept. 16 Mar 60, 33p. 7 refs. Technical rept. 077.
Order from LC mi$3.00, ph$6.30 PB 147 116

This report studies more effective methods and materials for preserving wooden structures exposed to marine boring organisms. It reports the results of treated and untreated test panels which are harbor-exposed to heavy Limnoria attack or to weakening by Martesia or teredine attack. (Author) (See also PB 143 053)

Naval Radiological Defense Lab., San Francisco, Calif.
THERMAL RADIATION DAMAGE TO CELLULOSIC MATERIALS. PART IV. INFLUENCE OF THE MOISTURE CONTENT AND THE RADIANT ABSORPTIVITY OF CELLULOSIC MATERIALS ON THEIR IGNITION BEHAVIOR, by S. Martin, K. A. Lincoln, and R. W. Ramstad. 30 Dec 58, 28p. 13 refs. Research and Development Technical rept. USNRDL-TR-295; AFSWP-1117; AD-216 545.
Order from LC mi$2.70, ph$4.80 PB 146 845

Measurements of the radiant exposure required for the ignition of alpha-cellulose at controlled levels of humidity and for various radiant absorptances show that the influence of the moisture content and the absorptivity of the material on its ignition behavior can be accounted for by the appropriate modification of the correlation moduli. Data were obtained for dark cellulosic sheet fuel in the relative humidity range 10 to 87 percent and for sheet cellulose having a broad range of absorptance values. The data for all but the white cellulose correlate well to a single ignition behavior pattern. Limited experimentation with white cellulose indicates that for materials in the low range of absorptivity, the absorptance multiplier in the irradiance modulus should be raised to a power less than unity. (See also PB 142 177)

Office of Technical Services, Dept. of Commerce, Washington, D. C.
WOOD (1950-1960). Apr 60, 18p. 276 refs. OTS Selective Bibliography 408.
Order from OTS $0.10 OTS SB-408

A bibliography of reports listed in the two OTS monthly abstract journals: U.S. Government Research Reports and Technical Translations. Reports and translations are arranged in sections as follows: wood, general; cutting tools; wood preservation; wood pulp; and forests and forestry.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
A MULTIPLICATIVE MODEL FOR ANALYZING VARIANCES WHICH ARE AFFECTED BY SEVERAL FACTORS, by Robert Bechhofer. Technical rept. no. 40 on Contracts N6onr-251(26) and AF 49(638)230. 10 July 59, 43p. 24 refs. AD-220 443.
Order from LC mi$3.30, ph$7.80 PB 147 062

A new way is proposed for looking at multifactor experiments which are conducted to study the effect of changes in the levels of the factors on the variance of a chance variable. A mathematical model is proposed which assumes that the effect of changing a factor from level 1 to level 2 is to multiply the original variance of the chance variable by a positive constant. This is in contrast to a model which assumes that the effect of changing a factor from level 1 to level 2 is to add a constant to the original variance of the chance variable. Thus a multiplicative model allows one to speak of relative (percentage) changes; an additive model allows one to speak of absolute changes. The univariate multiplicative model for variances is introduced and its experimental interpretation in classical terms is given. Factorial experiments, experimental designs, and the concept of an approximating multiplicative response surface for variances are also described. (Author)

Applied Mathematics and Statistics Lab., Stanford U., Calif.
THE OPTIMALITY OF (S, s) POLICIES IN THE DYNAMIC INVENTORY PROBLEM, by Herbert Scarf. Technical rept. no. 11 on Contract Nonr-225(28). 10 Apr 59, 13p. 5 refs.
Order from LC mi$2.40, ph$3.30 PB 146 052

This paper considers the dynamic inventory problem with an ordering cost composed of a unit cost plus a reorder cost. It is shown that if the holding and shortage costs are linear then the optimal policy in each period is always of the (S, s) type. More general conditions on the holding and shortage costs are given which imply the same result. A similar result is also given in the case of a time lag in delivery. (Author)

Applied Mathematics and Statistics Lab., Stanford U., Calif.
SLIPPAGE PROBLEMS, by Samuel Karlin and Donald Truax. Technical Rept. no. 28 on Contract Nonr-225(21). 8 June 59, 62p. 11 refs.
Order from LC mi$3.90, ph$10.80 PB 146 425

Roughly, the problem is as follows: We wish to compare n populations which have density functions $f(x, \theta_1)$, $f(x, \theta_2)$, ..., $f(x, \theta_n)$. On the basis of a sample from each population we want to decide if all the θ_i are equal or if not, which is the largest. Actually a more restricted problem is considered in this paper in which either all parameter values are equal, or all but one are equal and the exceptional one is larger. If the i^{th} one is larger we will say it has slipped to the right.

Applied Mathematics and Statics Lab., Stanford U., Calif.
SUFFICIENT CONDITIONS FOR UNCONSTRAINED OR CONSTRAINED MAXIMIZATION OF A QUASI-CONCAVE FUNCTION by Kenneth Arrow. Technical rept. no. 75 on Contract Nonr-225(50). 30 June 59, 20p. 7 refs. AD-219 877.
Order from LC mi$2.40, ph$3.30 PB 146 427

The sufficiency is investigated for the vector variable x assuming that the function f(x) is quasi-concave, i.e., for each real number c, the set $[x:f(x) \geqq c]$ is concave. Assume that the vector x can be partitioned into vectors x^1, x^2 such that $\bar{f}_{x^1} > 0$, $\bar{f}_{x^2} > 0$, $\bar{x}^2 = 0$. (The bar denotes evaluation at x; x will be a column vector, and f_x a row vector.) The function $f(x^1, 0)$ is shown to be maximum at $\bar{x}^1$ under certain (essentially local) regularity conditions. Theorems are presented which bear on the duality between constrained maxima and minima. From these theorems, a sufficient condition is derived for the maximization of a quasi-concave function. The relation between constrained maxima and the saddle point of the Lagrangian, L(x, y), is also discussed.

Brown U. [Div. of Applied Mathematics] Providence, R. I.
A NOTE ON REVEALED PREFERENCE, by David Gale. Technical rept. no. 4 on Contract Nonr-562(15). 1959, 11p. 2 refs. AD-220 052.
Order from LC mi$2.40, ph$3.30 PB 147 089

An economy is considered in which there are n goods and a single consumer with a fixed income which is assumed to be unity. For each set of unit prices, $p_1, \ldots, p_n$ which is assigned to the n goods it is assumed that the consumer chooses certain quantities $x_1, \ldots, x_n$ of these goods subject to the condition that the total cost of the goods does not exceed his income. The consumer's demand function D is defined as a mapping from non-negative (price) vectors $p = (p_1, \ldots, p_n)$ into non-negative (goods) vectors $x = (x_1, \ldots, x_n) = D(p)$ which satisfies the budget inequality, $pD(p) \leqq 1$, where juxtaposition of vectors stands for scaler product. The demand function D comes from a preference function if there exists a real valued function ϕ defined on non-negative (goods) vectors x such that $D(p) = \max_{px \leqq 1} \phi(x)$. A necessary condition that D come from a preference function is that it satisfy the weak axiom of revealed preference: If p and q are price vectors and $pD(q) \leqq 1$ and $qD(p) \leqq 1$ then $D(p) = D(q)$. An example is given of a demand function which satisfies the weak axiom but does not come from a preference function. (Author)

California U., Berkeley.
THE ANALYTIC EMBEDDING OF ABSTRACT REAL-ANALYTIC MANIFOLDS, by Charles B. Morrey, Jr. Technical rept. no. 21 on Contract Nonr-222(37). Jan 58, 67p. 13 refs.
Order from LC mi$3.90, ph$10.80 PB 138 282

H. Whitney (Ann. of Math. 37(1936) 645-680) ν-dimensional manifold of class C^n or C^ω can be mapped onto a real-analytic manifold situated in the real Euclidean space E_Q, $2\nu+1$ of $2\nu+1$ dimensions by a map of class C^n or C^ω respectively. The question

of whether or not an abstract real-analytic compact manifold can be mapped analytically onto such a manifold in $E_{2\nu+1}$ was left open. Bochner (Duke Math J. 3(1937)339-354) answered this question in the affirmative in the case where the manifold possesses an analytic Riemannian metric; this result was extended by Malgrange (Boll. Soc. Math. France 85(1957)101-113) to the case of non-compact manifolds. The present paper answers this question in the affirmative for compact manifolds without assuming the existence of an analytic Riemannian metric.

California U., Berkeley.
ASYMPTOTIC STABILITY OF SOLUTIONS OF PARABOLIC EQUATIONS UNDER VARIOUS BOUNDARY CONDITIONS, by Avner Friedman. Technical rept. no. 6 on Contract Nonr-222(62). Apr 59, 66p. 19 refs. AD-219 328.
Order from LC mi$3.90, ph$10.80 PB 146 045

The asympotic stability is established for the second mixed boundary problem $Lu = f(x, t) + K(x, t, u)$, $\partial u/\partial T + g(x, t, u) = h(x, t)$ where $|\partial k/\partial u|$ is small and $\partial g/\partial u$ is positive and tends to a function $g(x)$ as $t \to \infty$. L is the general parabolic operator of the second order, and f is a sum of a linear function $g(x, t)$ and a nonlinear function $k(x, t, u)$ with $|\partial k/\partial u|$ sufficiently small. The second mixed boundary condition is: u is a given function on the base of a domain D, and $\partial u/\partial T = g(x, t, u)$ on the lateral boundary of D, g being monotone decreasing in u and $g(x, t, 1) = 0$. A proof is presented of a theorem on the asymptotic expansion of u and strong results are derived.

Colgate U., Hamilton, N. Y.
AN ALGORITHM FOR THE FACTORIZATION OF POSITIVE MATRICES, by Dante C. Youla. Rept. on Contract AF 30(602)2018. Apr 60, 19p. 4 refs. RADC-TN-60-4.
Order from LC mi$2.40, ph$3.30 PB 147 302

The solutions to many practical problems in electrical engineering depend on the factorization of a positive, real, rational matrix of the complex variable, p. The object of this report is to prove the basic result. The method employed is based on a technique developed by Oono Yosiro in conjunction with the problem of equivalent n-ports. (Author)

Columbia U., New York.
ON THE GEOMETRICAL MOMENTS OF SKEW-REGULAR SIMPLICES IN HYPERSPHERICAL SPACE, WITH SOME APPLICATIONS IN GEOMETRY AND MATHEMATICAL STATISTICS, by Harold Ruben. Rept. on Contract Nonr-266(59). [1959] 37p. 11 refs CU-2-59-Nonr-266(59) MS; AD-216 328.
Order from LC mi$3.00, ph$6.30 PB 146 429

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
A SIMPLIFIED PROCEDURE FOR FINDING LAPLACE TRANSFORMS, by Martin Blumberg. Rept. on Contract DA 36-039-sc-73170. 13 May 58, 18p. 5 refs. Technical memo. no. EDL-M141; AD-203 548.
Order from LC mi$2.40, ph$3.30 PB 147 019

A method is given for obtaining quickly the Laplace transform of certain functions. The procedure utilizes successive differentiations until delta functions are reached as a result of differentiation at a discontinuity. The Laplace transform of the original function is then found from the Laplace transform of the delta functions. The method is particularly easy to apply to functions possessing a finite number of non-zero derivatives; it is also applicable to functions possessing an infinite number of non-zero derivatives. Several examples are given. The relation between the Laplace transform and the exponential form of the Fourier Series is also indicated. (Author)

Flight Control Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
AN ITERATIVE PROCEDURE FOR OBTAINING FRACTIONAL ROOTS OF REAL NUMBERS, by Eugene M. Romer. Apr 59, 16p. WADC Technical note 59-116; AD-214 428.
Order from OTS $0.50 PB 161 085

An iterative procedure is derived to obtain any integral root of a number. The method is valid for any initial estimate greater than zero. Since the fractional root of a number can be expressed as the integral root of another number, this method can be used to find fractional roots. Two formulae are obtained, and the criteria for the use of each are established. Since only the use of the square root process is required in addition to the 4 basic arithmetic operations, this procedure is suitable for use on desk calculators and can esily be adapted for digital computer applications. (Author)

Hebrew U. (Israel).
RESEARCH IN THE AREA OF MATHEMATICAL ANALYSIS, by S. Agmon, A. Dvoretzky, and others. Annual summary rept. on Contract AF 69(052)187. Oct 59, 20p. AFOSR-TR-59-100; AD-232 061.
Order from LC mi$2.70, ph$4.80 PB 146 099

Contents:
Elliptic partial differential equations and related boundary value problems, by S. Agmon
Rearrangement of series and comparison of densities of sequences, by A. Dvoretzky
Initial value problems and differential algebra, by A. Robinson
Univalent functions, by E. Netanyahu
Tauberian theorems and summability, by A. Jakimowski
The Bergman kernel, by M. Maschler

Institute for Advanced Study, Princeton, N. J.
THE BACKWARD CAUCHY PROBLEM FOR PARABOLIC DIFFERENTIAL INEQUALITIES, by Milton Lees. Rept. on Contract AF 49(638)253. Jan 60, 6p. 5 refs. AFOSR-TN-60-112; AD-232 949.
Order from LC mi$1.80, ph$1.80 PB 146 085

An elementary proof is given of the uniqueness of the Cauchy problem for second order parabolic equations and inequalities. (Author)

Institute for Advanced Study, Princeton, N. J.
A NONLINEAR TWO-POINT BOUNDARY VALUE PROBLEM, by Milton Lees. Rept. on Contract AF 49(638)253. Jan 60, 15p. 17 refs. AFOSR-TN-60-140; AD-232 948.
Order from LC mi$2.40, ph$3.30 PB 146 090

Existence, uniqueness, and finite-difference approximation theorems are obtained for a 2-point boundary value problem for the differential equation $u'' = f(x,u,u')$. The results require that the function $f(x,z,p)$ be such that $\partial f/\partial p$ is uniformly bounded and that $\partial f/\partial z$ be bounded from below by zero and from above by a continuous function of z alone. (Author)

Institute for Advanced Study, Princeton, N. J.
ON THE GEOMETRY OF MINKOWSKI PLANES, by E. Asplund and B. Grünbaum. Rept. on Contract AF 49(638)253. Apr 60, 10p. 8 refs. AFOSR-TN-60-436.
Order from LC mi$1.80, ph$1.80 PB 147 517

For any centrally symmetric, strictly convex set $K \subset E^2$ with smooth boundary B, the following theorem is established: If three translates of K cover B, they cover K too. This, and related propositions known for Euclidean circles, are proved for Minkowski planes. Some properties of convex curves which characterize centrally symmetric ones, or ellipses, are also discussed. (Author)

Institute for Advanced Study, Princeton, N. J.
PARTITIONS OF MASS-DISTRIBUTIONS AND OF CONVEX BODIES BY HYPERPLANES, by B. Grunbaum. Rept. on Contract AF 49(638)253. Jan 60, 6p. 8 refs. AFOSR-TN-60-110; AD-232 950.
Order from LC mi$1.80, ph$1.80 PB 146 086

Each half-space of E^n which contains the centroid of a convex body K, i.e., $K \subset E^n$, is shown to contain more than $1/e = 0.3678...$ of the volume of K. Related results are provided for arbitrary mass-distributions in E^n. (Author)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
A MAXIMUM PROPERTY OF CAUCHY'S PROBLEM IN THREE-DIMENSIONAL SPACE-TIME, by H. F. Weinberger. Rept. on Contract AF 49(638)228. Apr 60, 17p. 19 refs. Technical note BN-205; AFOSR-TN-60-464.
Order from LC mi$2.40, ph$3.30 PB 147 309

Cauchy's problem for the operator $Lu \equiv \frac{\partial^2 u}{\partial t^2} - Mu$ where M is a two-dimensional elliptic Beltrami operator is considered. It is shown that if the Gaussian curvature corresponding to M is non-negative and satisfies a differential inequality and if Lu and the initial value of $\partial u/\partial t$ are non-positive, the maximum of u is attained on the initial plane $t = 0$. (Author)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
POINCARÉ CYCLES AND ERGODIC BEHAVIOUR OF A LINEAR DIATOMIC CHAIN, by Leopoldo S. Garcia-Colin. Rept. on Contract AF 18(600)1315. Apr 60, 28p. 8 refs. Technical note BN-206; AFOSR-TN-60-466.
Order from LC mi$2.70, ph$4.80 PB 147 167

The ergodic behavious of a linear diatomic chain is shown to be analogous to that of a linear monoatomic chain. Starting with the expressions for the time relaxed correlation functions between any two particles in the chain, we show that the existence of Poincaré cycles is not inconsistent with the development of an equilibrium state. Also, we show that those dynamical variables which are ergodic for the linear monoatomic chain remain ergodic in the diatomic chain. It is shown that the auto correlation functions for particles with equal or different masses decay in time as $t^{-1/2}$. (Author)

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOME ISOPERIMETRIC INEQUALITIES FOR MEMBRANE FREQUENCIES AND TORSIONAL RIGIDITY, by L. E. Payne and H. F. Weinberger. Rept. on Contract AF 49(638)228. Feb 60, 13p. 11 refs. Technical note BN-194; AFOSR-TN-60-292.
Order from LC mi$2.40, ph$3.30 PB 146 422

It is shown that among all membranes of given area fixed on an outer boundary of given perimeter and free along any inner holes the annular membrane has the highest fundamental frequency. A similar result is derived for membranes that are elastically supported on the outer boundary. The method also leads to a lower bound for the torsional rigidity of a solid beam in terms of its area and perimeter. (Author)

Israel Inst. of Tech., Haifa.
EIGENVALUE PROBLEMS OF NONHOMOGENEOUS STRINGS, by Binyamin Schwarz. Technical (final) rept. on Contract AF 61(052)194. Jan 60, 5p. AFOSR-TR-60-57.
Order from LC mi$1.80, ph$1.80 PB 147 107

Technical note no. 1. Bounds for sums of reciprocals of eigenvalues. Technical note no. 2. On the extrema of the frequencies of nonhomogeneous strings with equimeasurable density.

Israel Inst. of Tech., Haifa.
ON THE EXTREMA OF THE FREQUENCIES OF NONHOMOGENEOUS STRINGS WITH EQUIMEASURABLE DENSITY, by Binyamin Schwarz. Technical (scientific) note no. 2 on Contract AF 61(052)194. Dec 59, 45p. 9 refs. AFOSR-TN-60-281
Order from LC mi$3.30, ph$7.80 PB 146 424

Laboratory of Statistical Research, U. of Washington, Seattle.
SMALL SAMPLE DISTRIBUTIONS FOR MULTI-SAMPLE STATISTICS OF THE SMIRNOV TYPE, by Z. W. Birnbaum and R. A. Hall. Technical rept.

no. 33 on Contract Nonr-477(11). 1 July 59, 20p. 6 refs. AD-219 994.
Order from LC mi$2.40, ph$3.30 PB 147 075

Consider c samples of sizes n_i, $i = 1, 2, \ldots, c$, from c independent univariate random variables X^i with continuous cumulative distribution functions F^i. Under the null hypothesis, $F^i = F^j$ for all $i, j = 1, 2, \ldots, c$, the exact small sample distribution of the statistics defined by $D(n_1, n_2, \ldots, n_c) = \sup_{x,i,j} | F^{*i}(x) - F^{*j}(x) |$, and $D^+(n_1, n_2, \ldots, n_c) = \sup_{x,i,j} [F^{*i}(x) - F^{*j}(x)]$, $i < j$ for any number c of samples and for any sample sizes $n_1, n_2, \ldots, n_c$ is obtained by solving simple difference equations. Using this procedure, tables are computed for values of $P[D(n, n, n) \leq r]$, $P[D(n, n) \leq r]$, and $P[D^+(n, n) \leq r]$ for selected values of n between 1 and 40, and of $r = k/n$, $k \leq n$.

Marsh, Richard W.
TABLE OF IRREDUCIBLE POLYNOMIALS OVER GF(2) THROUGH DEGREE 19. 24 Oct 57, 185p. 1 ref.
Order from OTS $3.00 PB 161 693

The tables contain all irreducible polynomials over GF(2), with the periods of their roots, through degree 19. For each degree the polynomials are exhibited as sequences of their coefficients, which are provided in order of descending power of X.

Massachusetts Inst. of Tech., Cambridge.
FUNDAMENTAL GROUPS ON A LORENTZ MANIFOLD, by J. Wolfgang Smith. Technical note on Contract AF 49(638)42. [1960] 34p. 8 refs. AFOSR-TN-60-357.
Order from LC mi$3.00, ph$6.30 PB 147 165

In the present paper we shall study certain conformal global properties which are described by means of an infinite collection of groups.

Massachusetts Inst. of Tech., Cambridge.
GENERALIZED TOPOLOGIES FOR STATISTICAL METRIC SPACES, by Edward Thorp. Technical note on Contract AF 49(638)42. [1959] 23p. 7 refs. AFOSR-TN-60-356.
Order from LC mi$2.70, ph$4.80 PB 147 164

Mathematics Research Center, U. of Wisconsin, Madison.
THE USE OF INTEGRAL TRANSFORMS FOR OBTAINING SERIES EXPANSIONS IN TERMS OF CERTAIN HIGHER TRANSCENDENTAL FUNCTIONS, I. FOURIER AND BESSEL TRANSFORMS OF FINITE TYPE, by F. Oberhettinger. Rept. on Contract DA 11-022-ORD-2059. Aug 58, 48p. 19 refs. MRC Technical summary rept. no. 38; AD-203 844.
Order from LC mi$3.30, ph$7.80 PB 147 023

The following investigations are based on the finite Fourier (or Bessel) integral transorm combined with some special Fourier (or Schloemilch) series expansions. The connection between infinite series of a particular type and integral transforms as described above admits the summation of a large number of series expansions involving higher transcendental functions. Many of the results obtained this way and listed here are believed to be new and some of them are generalization of known cases. Part I of this report is based upon the connection between Fourier series and Fourier integral of finite type by means of the interpolating property of the cardinal series. Part II is based upon Poisson's summation formula applied to functions whose Fourier cosine transforms are different from zero within a finite interval. The results in Part III are obtained by a generalization of the procedure used in Part I such that instead of Fourier series and integrals their generalizations i. e. Schloemilch series and Bessel transforms of finite type are used.

Minnesota U., Minneapolis.
A FAMILY OF INTEGRALS SERVING TO CONNECT THE WIENER AND FEYNMAN INTEGRALS, by R. H. Cameron. Technical rept. no. 12 on Contract AF 18(603)30. 23 Nov 59, 27p. 7 refs. AFOSR-TN-59-1272.
Order from LC mi$2.70, ph$4.80 PB 146 440

This paper gives a sequential definition of a family of integrals depending on a "variance parameter" σ^2. If σ^2 is real this reduces under reasonable conditions to the ordinary Wiener integral. If σ^2 is pure imaginary, the integral can be considered as a Feynman integral. For certain analytic functionals, it is shown that the Feynman integral reduces to an ordinary Wiener integral. (Author)

Minnesota U., Minneapolis.
A GENERAL CLASS OF LINEAR TRANSFORMATIONS OF WIENER INTEGRALS, by D. A. Woodward. Technical rept. no. 11 on Contract AF 18(603)30. 21 Apr 60, 38p. 4 refs. AFOSR-TN-60-36.
Order from LC mi$3.00, ph$6.30 PB 147 168

This paper is an extension of the linear transformation theorem of Cameron and Martin (Trans. Amer. Math. Soc. vol. 58). Let C be the space of continuous functions on [0, 1] which vanish at zero. A transformation formula is found for Wiener integrals under transformations carrying C onto C of the type $y(t) = x(t) + \int_0^1 L(t, s)dx(s)$. (Author)

Minnesota U., Minneapolis.
PROPERTIES OF MAXIMUM LIKELIHOOD ESTIMATORS IN NONSTABLE STOCHASTIC DIFFERENCE EQUATIONS, by Malempati Madhusudana Rao. Technical rept. no. 7 on Contract Nonr-2582(00). 31 July 59, 112p. 26 refs. AD-220 126.
Order from LC mi$6.00, ph$18.30 PB 147 087

The asymptotic properties are studied for estimators of parameters in the unstable processes. Processes satisfying a kth order, homogeneous (without constant terms), linear stochastic difference equation are studied in detail. For the general stochastic processes, hypotheses are formulated in terms of restrictions on the derivatives of the likelihood function. The

arbitrary finite order k are then considered. The results deal with a certain (first order least squares) estimator of the maximal (in absolute value) root of the difference equation, and the least squares estimators of the coefficients in the difference equation

Minnesota U., Minneapolis.
RELATIVE INTERPRETATIONS, by Steven Orey. Rept. on Contract AF 49(638)617. 2 Mar 60, 23p. 9 refs. AFOSR-TN-60-373.
Order from LC mi$2.70, ph$4.80 PB 147 122

The existence of relative interpretations of an elementary theory B into an elementary theory A are studied. New results are proved connecting the existence of such interpretations and syntatical assertions about B provable in the number theory of A. A by-product is an arithmetization of Gödel's first undecidability theorem. The existence of relative interpretations which preserve also non-provability is investigated. (Author)

North Carolina U., Chapel Hill.
STOCHASTIC BOUNDS ON THE "F" STATISTIC WHEN DATA ARE INCOMPLETE: ONE-WAY CLASSIFICATION, by Bernard S. Pasternack and Junjiro Ogawa. Technical rept. no. 11 on Estimation and Testing of Parameters by Order Statistics, Contract DA 36-034-ORD-2184. 26 Jan 60, 20p. 1 ref. OOR rept. 1597.15-M.
Order from LC mi$2.40, ph$3.30 PB 146 091

The present paper is concerned with obtaining analogous stochastic bounds on the F - statistic, when data are incomplete, for the case of one-way classification.

Office of Technical Services, Dept. of Commerce, Washington, D. C.
LINEAR PROGRAMMING (1950-1960). Apr 60, 4p. 50 refs. OTS Selective Bibliography 407.
Order from OTS $0.10 OTS SB-407

A bibliography of reports listed in the two OTS monthly abstract journals: U.S. Government Research Reports and Technical Translations.

Ohio State U. Research Foundation, Columbus.
ON REGULAR AND SINGULAR HARMONIC FUNCTIONS OF THREE VARIABLES, by Erwin Kreyszig. Technical rept. no. 2 on Contract AF 49(638)362. May 60, 28p. 12 refs. AFOSR-TN-60-456.
Order from LC mi$2.70, ph$4.80 PB 147 358

The present paper considers properties of regular and singular solutions of Laplace's equation

$$\Delta\phi = \phi_{xx} + \phi_{yy} + \phi_{zz} = 0$$

by means of function theoretical methods.

Purdue U. [Lafayette, Ind.]
A SPACE OF MULTIPLIERS OF TYPE $L^p(-\infty, \infty)$, by G. L. Krabbe. Technical note no. 1 on Contract AF 49(638)505. 20 Nov 59, 14p. 11 refs. AFOSR-TN-59-176; AD 211 316.
Order from LC mi$2.40, ph$3.30 PB 146 009

RIAS, Baltimore, Md.
BEHAVIOR OF SOLUTIONS NEAR INTEGRAL MANIFOLDS, by J. K. Hale and A. P. Stokes. Rept. on Contract AF 49(638)382. Mar 60, 65p. 23 refs. Technical rept. 60-10; AFOSR-TN-59-1222.
Order from LC mi$3.90, ph$10.80 PB 147 319

RIAS, Baltimore, Md.
EXISTENCE THEOREMS FOR PERIODIC SOLUTIONS OF NON-LINEAR DIFFERENTIAL SYSTEMS, by L. Cesari, Rept. on Contract AF 49(638)382. Mar 60, 36p. 26 refs. Technical rept. 60-8; AFOSR-TN-60-227.
Order from LC mi$3.00, ph$6.30 PB 147 317

The main idea is given which underlies a recent approach to existence theorems for periodic solutions of nonlinear differential systems, and a number of applications and results are summarized.

RIAS, Baltimore, Md.
FORCED OSCILLATIONS IN 3-SPACE, by Courtney Coleman. Rept. on Contract AF 49(638)382. Feb 60, 16p. 9 refs. Technical rept. 60-4; AFOSR-TN-60-57.
Order from LC mi$2.40, ph$3.30 PB 146 431

RIAS, Baltimore, Md.
ON AUTOMATIC CONTROLS, by S. Lefshetz. Rept. on Contract AF 49(638)382. Mar 60, 12p. Technical rept. 60-9; AFOSR-TN-60-230.
Order from LC mi$2.40, ph$3.30 PB 147 318

The problem of automatic controls has been treated more or less linearly by a number of Soviet authors (Lurye, Letov, Yacubovich). A treatment is presented taking account of the nonlinearity of the regulated system. Certain consequences of this nonlinearity are also made clear.

RIAS, Baltimore, Md.
PIECEWISE CONTINUOUS DIFFERENTIAL EQUATIONS, by J. Andre (Technische Hochschule, Braunschweig) and P. Seibert. Rept. on Contract AF 49(638)382. Mar 60, 13p. 2 refs. Technical rept. 60-6; AFOSR-TN-60-232.
Order from LC mi$2.40, ph$3.30 PB 147 315

A brief survey of the local properties of solutions of systems of piecewise continuous differential equations near the surfaces of discontinuity is given. Some properties of the corresponding systems with retardation [time-lag, switching delay] are discussed with emphasis on the so-called after-endpoint motions. (Author)

RIAS, Baltimore, Md.
ULTIMATE BOUNDEDNESS AND STABILITY UNDER PERTURBATIONS, by P. Seibert. Rept. on Contract AF 49(638)382. Mar 60, 22p. 8 refs. Technical rept. 60-7; AFOSR-TN-60-231; AD-233 733.
Order from LC mi$2.70, ph$4.80 PB 147 316

The first half of the paper concerns the preservation of ultimate boundedness of a dynamical system under

perturbations. The results are centered around a general principle, according to which the motions of the unperturbed and of a perturbed system with the same initial point remain within a certain fixed maximal distance from each other for all time, if they do so for a small length of time and if, in addition, the unperturbed system is ultimately bounded. This result is then applied to the problem of preservation of stability under perturbations and a necessary and sufficient condition for the latter is obtained. (Author)

Rutgers State U., New Brunswick, N. J.
THE SPHERICAL SUMMABILITY TO CONJUGATE MULTIPLE FOURIER-STIELTJES SERIES, by Victor L. Shapiro. Rept. on Contract AF 18(600)1595. 16 Feb 60, 60p. 13 refs. AFOSR-TN-60-213.
Order from LC mi$3.60, ph$9.30 PB 146 445

Rutgers State U., [New Brunswick, N. J.]
SURFACE SPHERICAL HARMONIC EXPANSIONS, by Victor L. Shapiro. Rept. on Contract AF 18(600)1595. 18 Mar 60, 29p. AFOSR-TN-60-339.
Order from LC mi$2.70, ph$4.80 PB 146 908

Statistical Lab., Case Inst. of Tech., Cleveland, Ohio.
THE USE OF SAMPLE QUASI-RANGES IN SETTING CONFIDENCE INTERVALS FOR THE POPULATION STANDARD DEVIATION, by F. C. Leone, Y. H. Rutenberg, and C. W. Topp. Rept. on Contract AF 49(638)361. Mar 60, 20p. 8 refs. AFOSR-TN-60-408.
Order from LC mi$2.40, ph$3.30 PB 146 872

The problem is the choice of an optimal selection method of quasi-ranges for setting one sided confidence bounds and confidence intervals for the standard deviation from a given distribution. The proposed methods of optimal selection are applied to random ordered sample from the normal, exponential and rectangular distributions. Tables of confidence bounds for the standard deviation of these distributions are given for confidence levels commonly used in statistical work. These are compared with the results of standard procedures. (Author)

Statistical Techniques Research Group, Princeton U., N. J.
PERMUTATION SUPPORT FOR MULTIVARIATE TECHNIQUES, by Harvey J. Arnold. Technical rept. no. 14 on Contract DA 36-034-ORD-2297. [1951] 96p. 17 refs. OOR rept. 1715-....; AD-208 613.
Order from LC mi$5.40, ph$15.30 PB 147 147

The multivariate generalization of the t test is investigated. The first four permutation cumulants are determined for a statistic which is a simple function of the commonly used Hotelling's T^2. In the univariate situation T^2 simply becomes the square of t, and tests based on T^2 are identical with tests based on t. The derived permutation cumulants are applied to data obtained from a sampling experiment. The samples are from bivariate normal and rectangular populations. A discussion of various ways of adjusting the test criterion is included when one suspects that the data does not come from a normal distribution.

Syracuse U., Ithaca, N. Y.
RADIAL DISTRIBUTION AND DEFICIENCIES OF THE VALUES OF A MEROMORPHIC FUNCTION, by Albert Edrei, Wolfgang H. J. Fuchs, and Simon Hellerstein. Rept. on Contract AF 49(638)571. Mar 60, 23p. 5 refs. AFOSR-TN-60-337.
Order from LC mi$2.70, ph$4.80 PB 146 926

Let f(z) be a meromorphic function and let $\delta(\tau, f)$ denote the deficiency, in the sense of R. Nevanlinna, of the value τ. The authors show that certain simple behaviors of the arguments of the zeros and of the poles of f(z) are almost sufficient to induce the inequalities
$\delta(0, f) > 0$ $\delta(\infty, f) > 0$.

Technion Research and Development Foundation, Ltd. (Israel).
INTEGRAL TRANSFORMS WITH TWO REPRODUCING PROPERTIES, by Jacob Steinberg. Final technical rept. on Contract AF 61(052)192. Oct 59, 56p. 8 refs. AFOSR TR-60-13; AD-232 066.
Order from LC mi$3.60, ph$9.30 PB 146 096

A constructive definition is given of the integral transforms J whose kernel depends on a real parameter $b > 1$, and possess the 2 properties: (1) $Jp = p$, for every polynomial p, and for each fixed $b > 1$; and (2) $Jf \longrightarrow f$, when $b \longrightarrow 1 + 0$, for every function f which is regular in a strip containing the real axis and which decreases exponentially at infinity. A new type of expansion of functions regular in an angle is considered the case where all derivatives of such a function vanishes at the corner of the angle is connected with our J - transforms is also studied. Elementary eigenfunctions of Weierstrass' singular integral are studied. Every real number, not zero, is found to be an eigenvalue of infinite multiplicity. (Author)

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
RECURRENCE FORMULAE AND TABLES FOR HEMISPHERICAL HARMONICS, by Choong Yung Cho. Rept. on Contract N7onr-285(11). 15 July 59, 42p. 3 refs. Technical rept. WIS-ONR-37; AD-225 590.
Order from LC mi$3.30; ph$7.80 PB 147 085

Recurrence formulas and numerical tables are provided for A^m_{nk} and B^m_{nk}, coefficients of expansion of the associated Legendre polynomials in terms of the hemispherical harmonics.

$$P^m_n(\mu) = \sum_{k=0}^{n-1} A^m_{nk} \sqrt{1-\mu^2}\, \bar{P}_k(\mu) \quad (m: \text{odd})$$

$$= \sum_{k=0}^{n+1} B^m_{nk} \frac{1}{\sqrt{1-\mu^2}}\, P_k(\mu) \quad (m: \text{odd})$$

where $2\mu = 1 - x$. (Author)

Washington U., St. Louis, Mo.
MEAN SUMMABILITY ULTRASPHERICAL POLYNOMIALS, by Richard Askey and I. I. Hirschman, Jr. Rept. on Contract AF 49(638)218. Apr 60, 20p. 12 refs. AFOSR-TN-60-396.
Order from LC mi$2.40, ph$3.30 PB 146 783

The results of the present paper apply to ultraspherical polynomials. However for reasons of notational simplicity we confine ourselves here to the special case of Legendre polynomials.

Washington U., St. Louis, Mo.
MULTIPLIER TRANSFORMATIONS, II, by I. I. Hirschman, Jr. Rept. on Contract AF 49(638)218. Apr 60, 18p. 8 refs. AFOSR-TN-60-31.
Order from LC mi$2.40, ph$3.30 PB 146 780

This paper contains several different topics relative to multiplier transformations on spaces of functions over n dimensional Euclidean space E_n defined by weighted quadratic norms with positive definite weight functions.

Washington U., St. Louis, Mo.
ROOTS OF INNER AUTOMORPHISMS, by F. Haimo. Rept. on Contract AF 49(638)218. Apr 60, 13p. 2 refs. AFOSR-TN-60-32.
Order from LC mi$2.40, ph$3.30 PB 146 784

M. Auslander has proposed the problem of finding a group with an outer automorphism α with n-th power inner and n^2 - power trivial. Further, he requires that the fixed points of α lie in the center of the group. Starting with any group H, we form $H \oplus (H/H')$, reducing this direct sum by a suitable subgroup. If the reducing subgroup is properly chosen, the quotient group has a normal automorphism with a power which is inner. Examples are more readily obtained if H is of class 2.

Wayne State U., Detroit, Mich.
CONFORMAL MAPS OF ALMOST KAEHLER MANIFOLDS, by S. I. Goldberg. Rept. on Contract AF 49(638)14. Jan 60, 20p. 8 refs. AFOSR-TN-60-95; AD-232 556.
Order from LC mi$2.40, ph$3.30 PB 146 087

Groups of conformal maps of almost Kaehler manifolds are studied. The following theorem is proved: The largest connected Lie group of conformal transformations of a compact almost Kaehler manifold M^{2n} $(n>1)$ coincides with the largest connected group of automorphisms of the almost Kaehler structure. This generalizes a corresponding theorem established by Lichnerowicz for Kaehler Manifolds. By restricting the conformal maps to those whose associated 1-forms are closed, a much wider class of manifolds may be considered. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
PROGRAMMING AN IDEALIZED GENERAL-PURPOSE COMPUTER TO DECIDE QUESTIONS OF TRUTH AND FALSEHOOD, by Irving M. Copi and Robert W. Beard. Rept. on Project Michigan, Contract DA 36-039-sc-52654. Apr 59, 17p. 5 refs. Rept. no. 2144-402-T; AD-214 305.
Order from LC mi$2.40, ph$3.30 PB 146 244

Routines are formulated and explained for the programming of a general-purpose digital computer to decide the validity or invalidity of 3 kinds of logical formulas: formulas of the propositional calculus containing up to 2000 variables, the equality formulas, and formulas of the monadic predicate calculus. Results show that the routines contain improvements over the usual decision procedures from the point of view of computational facility.

Computing Devices

General Electric Microwave Lab., Palo Alto, Calif.
MICROWAVE COMPUTER RESEARCH, by M. P. Forrer. Quarterly progress rept. on Contract Nonr-2127(00). 31 Oct 57, 31p. 1 ref. Rept. no. R57ELM79-1.
Order from LC mi$3.00, ph$6.30 PB 137 719

The present report represents a continuation of the analysis of millimicrosecond pulse transmission, which was discussed in the previous report. Specifically, the problems occurring in the presence of losses are studied, and some simple criteria are found which define the limitations on the validity of the present theory. (See also PB 136 999)

Naval Ordnance Test Station, China Lake, Calif.
NODAC: THE NAVAL ORDNANCE DATA AUTOMATION CENTER, by R. V. Herman, H. V. Hilker, and J. B. Moffett. Jan 60, 22p. NOTS TP-2394; NAVORD rept. 7027.
Order from LC mi$2.70, ph$4.80 PB 147 433

NODAC is a data-reduction machine that, by means of plug-in logic packages and patchboards, can be adapted to any data-reduction problem in a very short time. The machine is designed to take full advantage of the capabilities of the IBM-709 computer. It consists of analog and digital sections interconnected by a converter unit through which conversions can be made in either direction at a current rate of 25,000 samples per second. It is currently in use on Naval Ordnance Test Station data-reduction programs, and, as various units are added to bring its capabilities up to the design standard, it will be able to handle these programs on decreasing time scales. (Author)

Systems Technology, Inc., Inglewood, Calif.
SURVEY OF ANALOG CROSS-SPECTRAL ANALYZERS, by Lester J. Seltzer and Duane T. McRuer. Rept. on Contract AF 33(616)5822. Dec 59, 74p. 28 refs. WADC Technical rept. 59-241.
Order from OTS $2.00 PB 161 704

This report presents a survey of analog devices which have been used to compute cross-spectra in the processing of data from human response experiments. The machines described have been analyzed to show the principles upon which they depend. Where available, the results of calibration experiments have been included as a measure of specific performance. Correlation and spectral measurement are discussed, introductory to consideration of measurement fundamentals for closed loop human response tests. Theoretical ways of calculating cross-spectra are presented and referred to the mechanization of the cross-spectral machines. The effect of nonideal elements on the

performance theoretically attainable is considered, together with a discussion of the accuracy of spectral estimates. (Author)

MECHANICS

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON PRAGER'S HARDENING RULE, by R. T. Shield and R. Ziegler. Technical rept. no. 30 on Contract Nonr-562(10). Jan 58, 26p. 10 refs. Rept. C11-30.
Order from LC mi$2.70, ph$4.80 PB 137 961

Bureau of Ships, Washington, D. C.
MECHANICAL IMPEDANCE, by Robert Plunkett (General Electric Co.). Nov. 58, 35p. 24 refs. Rept. no. 375-N-31; AD-214 656.
Order from LC mi$3.00, ph$6.30 PB 147 586

David Taylor Model Basin, Washington, D. C.
THE GRAPHICAL SOLUTION OF 45-DEGREE STRAIN-ROSETTE DATA AND DETERMINATION OF ERROR IN THE CALCULATED STRESSES DUE TO ERRORS IN MEASURED STRAINS, by Margaret E. Duke and Edward Wenk, Jr. Nov 49, 22p. 20 refs. Rept. 600.
Order from LC mi$2.70, ph$4.80 PB 147 270

The state of stress in a biaxial field can be determined experimentally by measurement of strains along any three gage lines. The reduction of data by orthodox computation is generally so laborious, however, that various mechanical and graphical systems have been devised to simplify solutions. A number of these methods are described and discussed in this report. The graphical system found to be most satisfactory is reproduced in chart form for use in determining, from 45-degree strain-gage rosettes, principal stresses, maximum shear stresses, and orientation of principal axes.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
EXPERIMENTAL INVESTIGATIONS OF THE INTERACTION BETWEEN A SHOCK AND A MAGNETIC FIELD, by John Paul Barach. Rept. on Contract AF 49(638)401. Mar 60, 31p. 12 refs. Technical note BN-203; AFOSR-TN-60-439.
Order from LC mi$3.00, ph$6.30 PB 147 005

A magnetic interaction has been observed with flows of Mach number about 15 in krypton and inhomogeneous magnetic field of about 50,000 gauss. The loss of momentum flux in the gas flow is proportional to the magnetic impulse taken up to a point, where there seems to be a sudden adjustment of flow velocity. The position of this point is determined by the parameter $\sigma v B^2/P$. The higher this parameter, the earlier the interaction and the less its total effect. Moderately low values of the parameter produce the largest effects. (Author)

Institute of Engineering Research, U. of California, Berkeley.
ON THE STRUCTURE OF THE BOUSSINESQ-PAPKOVICH STRESS FUNCTIONS AND THE RELATED COMPLETENESS PROOF, by P. M. Naghdi and C. S. Hsu. Technical rept. no. 4 on Contract Nonr-222(69). July 59, 21p. 17 refs. Series no. 131, issue no. 4; AD-230 632.
Order from LC mi$2.70, ph$4.80 PB 147 097

Lubrication Lab., Mass. Inst. of Tech., Cambridge.
FRICTION AND WEAR AT ELEVATED TEMPERATURES, by Ernest Rabinowicz. Rept. on The Structure and Properties of Interfaces, Contract AF 33(616)5963. Jan 60, 25p. 11 refs. WADC Technical rept. 59-603.
Order from OTS $0.75 PB 161 719

A new high-temperature friction apparatus has been constructed which allows sliding experiments to be carried out at temperatures to 2000 F. in controlled atmospheres, and at speeds varying over a wide range. Tests have been run on this machine and on an older machine. These and other results are discussed theoretically in terms of the surface energy --- hardness ratio and of the wear coefficient. From the experimental results, it appears that the main influence of temperature on the friction and wear results is through changes of hardness, of surface energy, and of tensile strength. (Author)

Minnesota U., Minneapolis.
ON THE UTILIZATION OF THE CONCEPT OF BOUNDARY IMPEDANCE IN VIBRATIONS OF BARS, by F. J. Wilmers and R. F. Lambert. Rept. for 5 Sep 58-15 June 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5426. Feb 60, 44p. 11 refs. WADC Technical rept. 59-545.
Order from OTS $1.25 PB 161 740

This report deals with the utilization of boundary impedance in describing conditions at the extreme boundaries of a bar and its measurement by employing techniques derived from electrical transmission line theory. Important similarities and differences between a mechanical and electrical transmission lines are discussed. The concepts are applied to the measurement of a reactive termination and to the development of a "complex conjugate" matching section. These concepts also present a convenient specification of boundary conditions in applications involving random vibrations and fatigue. (Author)

Minnesota U., Minneapolis.
STEADY STATE DAMPED VIBRATIONS AND STABILITY OF A CLASS OF NONLINEAR DISCRETE SYSTEMS, by S. T. Chow and P. R. Sethna. Rept. for Oct 58-July 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5426. Mar 60, 52p. 7 refs. WADC Technical rept. 59-543.
Order from OTS $1.50 PB 161 748

A class of nonlinear discrete systems with an arbitrary number of degrees of freedom are studied for their steady state vibrations. The coordinates are first transformed to the principal coordinates corresponding

to the linear part of the system. An iteration scheme is used to obtain the desired solutions. Some special effects of the relations between the linear natural frequencies on the qualitative nature of the solutions are demonstrated. It is shown that if the linear natural frequencies do not possess certain relations, the system can be treated in a manner similar to that for a system of a single degree of freedom. In other cases the procedure gets more complicated. The various solutions are then examined for their stability. Poincare's theory of singularities in the phase plane is used to study the stability of those problems that can be treated in a manner similar to that for a single degree of freedom system. In all other cases the stability is examined by applying the Routh-Hurwitz criterion to a transformed set of equations. Solution for one specific problem is obtained and checked against those obtained from an analog type computer. (Author)

Polytechnic Inst. of Brooklyn, N. Y.
APPLICATION OF AN ASYMPTOTIC NUMERICAL METHOD TO A PROBLEM OF BEAM BENDING, by J. R. M. Radok and Marie Wolfson. Rept. on Contract Nonr-839(26). July 59, 13p. 5 refs. PIBAL rept. no. 499; AD-220 071.
Order from LC mi$2.40, ph$3.30 PB 147 065

With a view to later applications to problems of shell theory, an iterative numerical method based on a system of parabolic equations has been applied to a problem of beam bending. The various stages of the process are given in detail and the numerical results are discussed in relation to the exact solution.

Polytechnic Inst. of Brooklyn, N. Y.
EFFECTS OF COMPRESSIBILITY ON CREEP, by Sharad A. Patel, B. Venkatraman and William P. Vafakos. Rept. on Contract Nonr-839(23). July 59, 15p. 4 refs. PIBAL rept. no. 496; AD-220 050.
Order from LC mi$2.40, ph$3.30 PB 147 064

An elementary device for including compressibility effects on the creep behavior of materials in presented. A hollow sphere subjected to uniform pressures is analysed to illustrate these effects. The stress solution is presented in closed parametric form. (Author)

Purdue U. Div. of Engineering Sciences, Lafayette, Ind.
THE ELASTIC HALF-PLANE SUBJECTED TO SURFACE TRACTIONS WITH RANDOM MAGNITUDE OR SEPARATION, by A. Cemal Eringen and J. W. Dunkin. Technical rept. no. 15 on Contract Nonr-1100(02). June 59, 35p. 2 refs. AD-205 781.
Order from LC mi$3.00, ph$6.30 PB 146 476

First and second order moments of the stress tensor are obtained for the elastostatic problem concerning the half-plane subjected to random boundary tractions. The cases treated include the following types of applied surface tractions: (a) a purely random Gaussian load (white noise); (b) concentrated loads of random magnitudes separated by equal intervals; (c) a concentrated load acting at a random location; and (d) concentrated loads of equal magnitudes separated by random intervals. (Author)

Stanford U., Calif.
A LARGE-DEFORMATION BENDING THEORY FOR THIN CYLINDRICAL SHELLS, by W. Flügge and B. R. Baker. Rept. on Contract Nonr-225(16). 1 June 59, 60p. 7 refs. Div. of Engineering Mechanics Technical rept. no. 117; AD-220 388.
Order from LC mi$3.60, ph$9.30 PB 146 515

A nonlinear bending theory is developed to study the stresses and deformations of a cylindrical shell in and near a zone in which the bending effect is very pronounced. (Author)

Watertown Arsenal Labs., Mass.
RESPONSE OF BEAMS TO DYNAMIC PRESSURE LOADING WITH MEMBRANE EFFECTS INCLUDED, by E. W. Ross, Jr. Mar 60, 25p. 9 refs. Technical rept. no. WAL TR 834.12/1.
Order from LC mi$2.70, ph$4.80 PB 147 280

The plastic-rigid model of beam behavior is used to calculate the response of either simple or clamped beams to rapidly applied transverse loads which are symmetrically distributed about the midpoint of the beam. The effects of membrane force are included in the analyses. A specific example is worked out to show the effect of including membrane force in the analysis of a beam. (Author)

Aerodynamics and Pneumatics

Aeronautical Research Lab., Wright Air Development [Division] Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL STUDY OF VORTEX CHAMBER FLOW, by Jack P. Holman and George D. Moore. Oct 59, 35p. 8 refs. WADC Technical note 59-388.
Order from OTS $1.00 PB 161 700

It is shown that a relatively simple analysis predicts the functional variation of temperature and pressure in a vortex chamber with radius and inlet velocity. The predicted variation is in good agreement with experimental observations. By assuming that the flow at the outside of the chamber occupies some effective flow area, which is essentially independent of flow rate, the inlet velocity may be expressed in terms of the chamber dimensions and the fluid properties at entrance. The effective flow area assumption is verified experimentally for two chamber exit configurations using air. It was found that the velocity in a five-inch diameter chamber, four inches long, could be represented by the expression

$$V r^{n} = \text{Const.}$$

with $n = 0.68$. The pressure and temperature were related through

$$T p^{\frac{1-n_1}{n_1}} = \text{Const.}$$

with $n = 1.28$. It is shown that, given either n or n_1, one may calculate the other with a simple relationship. (Author)

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
ON THE USE OF QUATERNIONS IN SIMULATION OF RIGID-BODY MOTION, by Alfred C. Robinson. Rept. on Flight Dynamics Research and Analysis Facility. Dec 58, 97p. 7 refs. WADC Technical rept. 58-17.
Order from OTS $2.25 PB 161 732

The theory of the four-parameter method is developed with specific application to coordinate conversion in aircraft simulations. This method is compared with the direction cosine method both in a theoretical error analysis and in an example simulation on an analog computer. It is shown that the quaternion method is no more sensitive to multiplier errors than is the direction cosine method, and it requires nearly 30 per cent less computing equipment. In addition, the multiplier bandpass requirement in the four-parameter method is only half as severe as for direction cosines. By every important criterion, the quaternion method is no worse than, and in most cases, better than the direction cosine method. (Author)

Air Force Missile Development Center, Holloman AFB, N. Mex.
STUDIES ON DYNAMICS AND INSTRUMENTATION OF THE HOLLOMAN TRACK. Rept. for 1956-1958. Apr 59, 584p. 90 refs. AFMDC-TR-59-8; AD-210 870.
Order from LC mi$11.10, ph$89.40 PB 146 771

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Calculation of the flexural rigidity of the Holloman track
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Some remarks on the optimum speed attainable with a two-stage sled
Ram wind tunnel
Preliminary investigation of the aerodynamic effects of linear acceleration as related to the high-speed track
Parameters for rocket sled propulsion systems

Arnold Engineering Development Center, [Tullahoma, Tenn.]
AERODYNAMIC HEATING FACILITIES, by J. Leith Potter. Rept. on ARO, Inc., Contract AF 40(600)-700 S/A 13(59-1). July 58, 17p. 10 refs. AEDC-TR-58-7; AD-161 033.
Order from LC mi$2.40, ph$3.30 PB 147 145

This is a discussion of ground test facilities providing simulation, to some degree, of the aerodynamic heating and loading encountered by aircraft or spacecraft operating within the earth's atmosphere. The ranges of speed, stagnation conditions and their time derivatives corresponding to typical missile trajectories are used to demonstrate the problem of flight simulation. Means for achieving partial simulation in laboratories are described, with consideration given to the advantages and disadvantages of most of the methods currently used or being studied. (Author)

Arnold Engineering Development Center [Tullahoma Tenn.]
DETERMINATION OF OPTIMUM OPERATING PARAMETERS FOR THE 1-FOOT TRANSONIC TUNNEL UTILIZING CONE-CYLINDER BODIES OF REVOLUTION, by William L. Chew, Jr. Rept. on ARO, Inc. Contract AF 40(600)800. Apr 60, 45p. 7 refs. AEDC-TN-60-69.
Order from LC mi$3.30, ph$7.80 PB 146 764

Tests were conducted in the 1-Foot Transonic Tunnel to determine optimum operating parameters which minimize tunnel interference effects with the 60-deg inclined hole, 6-percent open-area test section configuration. Pressure distributions on a 20-deg cone-cylinder model having a blockage ratio of 1.86 percent were used to determine optimum test section wall angle positions. A similar cone-cylinder model with 1-percent blockage ratio was used to investigate the effects of tunnel pressure ratio and support interference on base pressure measurements at various axial locations of the model in the test section. Minimum tunnel interference on the pressure distribution of the 20-deg cone-cylinder model resulted by varying the wall angle from 40-min convergence to 30-min divergence to 30-min divergence for a Mach number range from 1.10 to 1.50. Below Mach number 1.10 the effect of varying wall angle on the pressure distribution was negligible. Base pressure coefficients on the 1-percent blockage model as affected by the axial position in the tunnel and variations in tunnel pressure ratios are presented. (Author)

Arnold Engineering Development Center [Tullahoma, Tenn].
PRESSURE MEASUREMENTS IN AN ARC-DISCHARGE WIND TUNNEL, by M. R. Mulkey, W. T. Earheart, Jr., and E. E. McAdams, Jr. Rept. on ARO, Inc., Contract AF 40(600)700 Sup. 6(58-1). Apr 58, 31p. 2 refs. AEDC-TN-58-16; AD-152 048.
Order from LC mi$3.00, ph$6.30 PB 147 008

The pressure instrumentation for a 16-in. arc-heated hypervelocity wind tunnel is described. The tunnel has a Laval nozzle for expansion to supersonic speeds, a test section of uniform area, and a vacuum tank. Upstream of the Laval nozzle is a high-pressure reservoir in which the air is energized by arc-heating. Depending on the specific initial conditions, the run times varied from 25 to 40 msec. Commerical transducers and equipment were investigated, and the problem of electrical interference was studied. Low-impedance transducers and data-recording systems are discussed.

Arnold Engineering Development Center [Tullahoma, Tenn.]
WIND TUNNEL TESTS ON AN AERIAL TARGET MODEL AT TRANSONIC AND SUPERSONIC SPEEDS, by W. L. Chew and W. E. Carleton. Rept. on ARO, Inc., Contract AF 40(600)800. July 59, 110p. 3 refs. AEDC-TN-59-84; AD-219 990.
Order from LC mi$5.70, ph$16.80 PB 147 375

Static stability characteristics of the 0.22-scale aerial target model with attached launching lugs were investigated in the 1-ft transonic and supersonic tunnels. Test data were obtained at M = 0.8, 1.0, 1.2, 1.4 and 1.5 through an angle-of-attack range from 13^{o} to $+12^{o}$ in the transonic tunnel and M = 1.5 and 2.0 through an angle-of-attack range from -3^{o} to $+8^{o}$ in the supersonic tunnel. Reynolds numbers, based on maximum body diameter, were in the range from 0.52 to 0.68 million. Data showing the aerodynamic characteristics of the basic model and with launching lugs attached are presented as well as a comparison of the transonic and supersonic tunnel data at M = 1.5. The data show that the static stability characteristics of the aerial target model were only slightly affected by the attachment of launching lugs. Forebody axial force coefficients of the body-wing-tail configuration were increased by 38 to 48% with the launching lugs attached. Slight changes in normal force-curve slope, model stability, and in the roll-control effectiveness were indicated as the model was rolled from 0^{o} to $\pm 45^{o}$. (Author)

Avco-Everett Research Lab., Mass.
HALL EFFECTS IN A LAMINAR BOUNDARY LAYER OF THE HARTMANN TYPE, by James A. Fay. Rept. on Contract AF 49(638)659. Dec 59, 11p. Research rept. 81; AFOSR-TN-60-291.
Order from LC mi$2.40, ph$3.30 PB 147 434

The motion in a laminar boundary layer on an infinite flat plate with an applied magnetic field normal to the wall and current flow parallel to the wall is studied for the case of $\omega\tau$ (electrical cyclotron frequency times mean free time) not necessarily small. It is found that a cross flow is induced normal to both magnetic field and free stream flow. The net electrical power loss in the boundary layer is determined assuming constant transport properties. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
BOUNDARY LAYER TRANSITION ON THE NOL STANDARD CONE IN THE BALLISTIC RESEARCH LABORATORIES' SUPERSONIC WIND TUNNELS, by J. C. McMullen. Feb 60, 23p. 1 ref. Technical note no. 1303.
Order from LC mi$2.70, ph$4.80 PB 147 105

Boundary layer transition Reynolds numbers on the Naval Ordnance Laboratory 5^{o} standard cone model were obtained in the Ballistic Research Laboratories' Supersonic Wind Tunnels No. 1 and No. 3. The transition point was determined photographically. Transition Reynolds numbers were computed and are compared with data from other wind tunnels. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TABLES FOR DETERMINATION OF FLOW VARIABLE GRADIENTS BEHIND CURVED SHOCK WAVES, by Nathan Gerber and Joan M. Bartos. Jan 60, 29p. 11 refs. Rept. no. 1086.
Order from LC mi$2.70, ph$4.80 PB 146 770

The shock wave relations and the equations of isoenergetic two-dimensional or axisymmetric flows can be combined to yield expressions for various useful quantities behind a shock wave if the curvature is known in addition to the position and slope. Tables are presented here of computations, for $\gamma = 1.4$, of seven functions of Mach number and shock wave slope, from which the following are easily computed: (1) streamline curvature, (2) velocity gradient along streamline, (3) angle between streamline and density contour, and (4) angle between streamline and Mach number contour. In addition, the Mach number and angle of inclination of streamline are listed. A Mach number range from 1.1 to 10 is covered by these computations. A derivation of the shock gradient functions is presented; and several applications of the calculations are given, including a set of tables for determining the slope of the sonic line. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
NON-UNIFORM SHOCK PROPAGATION IN A STRATIFIED ATMOSPHERE, by R. E. Meyer and D. V. Ho. Technical rept. no. 20 on Contract Nonr-562(07). July 59, 32p. 4 refs. Rept. 562(07)/20; AD-220 292.
Order from LC mi$3.00, ph$6.30 PB 147 094

To test an hypothesis of Whitham (J. Fluid Mech., 4, 1958, 337) an approximate solution is developed for the gas motion behind a very strong shock travelling into a perfect gas with density varying rapidly in the direction of shock propagation. The approximation is valid for arbitrary density variation for heavy gases with ratio of specific heats sufficiently close to unity, and it furnishes reliable (and quite simple) results for air for density ratios of up to about 3 and down to about 0.2. As far as the evidence collected here supports Whitham, it shows his hypothesis to be a small (entropy) variation approximation; but the approximation obtained from the interaction of the shock with a contact discontinuity turns out to be at least as good. (Author)

Brown U. Div. of Engineering, Providence, R. I.
A STUDY OF CONFIGURATIONS COMPOSED OF A BODY UNDER A LIFTING WING IN SUPERSONIC FLOW, by C. F. Chen and Joseph H. Clarke. Rept. on Contract AF 49(638)444 and Subcontract to Applied Physics Lab., Contract NOrd-7386. Jan 60, 66p. 18 refs. AFOSR-TN-59-1276.
Order from LC mi$3.90, ph$10.80 PB 146 437

An investigation is made of supersonic aircraft configurations composed of a cambered body positioned a certain distance beneath an arbitrary lifting wing. The geometry of the wing is regarded as given and the geometry of the body may be given or optimum. Expressions for the drag and lift are obtained from reverse-flow considerations; these greatly implement such a study when interference cross-flows must be cancelled. The drag advantage to be gained when a given body and wing assume a given orientation is studied.

Brown U. Div. of Applied Mathematics, Providence, R. I.
SUPERSONIC FLOW PAST FINITE DOUBLE WEDGE WINGS OF VARIABLE THICKNESS. PART I. LINEAR VARIATION, by Maurice Holt and Bohyun Yim. Rept. on Contract AF 49(638)232. May 60, 37p. 4 refs. AFOSR-TN-60-431.
Order from LC mi$3.00, ph$6.30 PB 147 403

The pressure distribution and associated flow field is calculated on a finite span wing of double wedge section in a uniform supersonic stream. The wing is of constant chord and the leading edge is normal to the incident stream direction. The maximum thickness of the wing varies slowly in the spanwise direction so that the disturbed flow field is a small departure from plane flow. In this paper a wing with maximum thickness varying linearly with span is considered.

Brown U. Div. of Engineering, Providence, R. I.
TESTS OF A CONFIGURATION COMPOSED OF A BODY UNDER A LIFTING WING IN SUPERSONIC FLOW, by C. F. Chen. Rept. on Contract AF 49(638)444. Feb 60, 13p. 5 refs. Technical rept. WT-31; AFOSR-TN-59-1275. AD-233 944.
Order from LC mi$2.40, ph$3.30 PB 146 438

Tests were made on an arrangement consisting of a Sears-Haack body located under a lifting rectangular diamond profile wing. The Mach number was 1.6 and the Reynolds number was 9.17×10^5 based on the body length. The experiments were suggested by a previous theoretical study of such arrangements. It is found that the measured lift developed on the wing due to the flow field of the body agrees very well with the theoretical value. Downstream of the impinging shock from the wing, flow separation was observed on the exterior side of the body but not on the interior side. The separation is attributed not to the pressure rise across the shock but to the pressure field arising from the reflection from the body of the shock-induced cross flow. Further observations suggest that the separation can be avoided by pitching the body or by kinking the body at the shock wave to accommodate the shock-induced cross flow. (Author)

California Inst. of Tech., Pasadena.
SUPERSONIC FLUTTER ANALYSES INCLUDING AERODYNAMIC HEATING EFFECTS, by R. L. Harder, K. Lock and others. Rept. for June 58-Aug 59 on Dynamic Problems in Flight Vehicles, Contract AF 33(616)5767. Feb 60, 281p. 4 refs. WADC Technical rept. 59-559.
Order from OTS $4.00 PB 161 716

The purpose of this report is to study the effect that aerodynamic heating has upon the flutter calculation of a high speed wing. A short straight wing was analyzed in the Mach number range from one to five to see which parameters are the important ones to include in flutter calculations. Flutter results are given for several specific maneuvers and show that neglecting the effects of heating in the calculation may lead to unconservative results. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
BOUNDARY-LAYER TRANSITION AND HEAT TRANSFER IN SHOCK TUBES, by R. A. Hartunian, A. L. Russo, and P. V. Marrone. Rept. on Contract AF 18(603)141. Dec 59, 37p. 33 refs. Rept. no. AD-1118-A-3; AFOSR-TN-59-564; AD-216 759.
Order from LC mi$3.00, ph$6.30 PB 146 973

An experimental study is made of the wall boundary layer in a shock tube operated over a wide range of shock Mach numbers and pressure levels in air, including those for which real gas effects exist. Transition distances are determined, and correlated in terms of the transition Reynolds number based on a characteristic length for this boundary layer. Data from independent shock-tube studies are also included in this correlation.

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PRELIMINARY RESEARCH ON A MOLECULAR BEAM FOR THE 1-10 ev RANGE, by G. T. Skinner and C. E. Treanor. Rept. on Contract AF 18(603)141. Dec 59, 66p. 23 refs. Rept. no. AD-1118-A-9; AFOSR-TN-59-1086.
Order from LC mi$3.90, ph$10.80 PB 147 406

This report presents an interim discussion of the design and construction of a molecular-beam apparatus for the production of atomic and molecular beams in the 1-10 ev energy range. A shock tube is used as the source of high-temperature, high-pressure gas, and a hypersonic expansion is used to obtain a high-energy, nearly-mono-energetic beam. Use of a two-center potential for the treatment of atom-molecule collisions is discussed. (Author)

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
THE RESPONSE OF LAMINAR BOUNDARY LAYER TO IMPULSIVE MOTIONS, by Martin L. Rosenzweig. Rept. on Contract AF 18(600)1523. Feb 59, 104p. 26 refs. AFOSR-TN-59-92; AD-210 182.
Order from LC mi$5.70, ph$16.80 PB 146 843

The main body of the present work is concerned with the response of the laminar boundary layer in 2 dimensional, incompressible flow to impulsive

changes in velocity. In particular, the problem of stagnation-point flow against a wall which moves impulsively in its own plane is considered. A method is developed for the solution of this problem. Applications of this method are then made to the case of linearized, unsteady, laminar boundary-layer flow. Detailed calculations are carried out to determine the oscillatory response of the laminar boundary layer when the basic steady flow is that given by the potential velocity distribution. The results of these calculations are then used to find the response to impulsive changes of velocity.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
BOUNDARY-LAYER TRANSITION INDUCED BY A VIBRATING RIBBON ON A FLAT PLATE, by Francis R. Hama. Rept. on Contract AF 49(638)645. Feb 60, 34p. 18 refs. Technical note no. BN-195; AFOSR-TN-60-290.
Order from LC mi$3.00, ph$6.30 PB 146 423.

Flow patterns associated with the boundary-layer transition induced by a vibrating ribbon are investigated on a flat plate by means of visual observation of dye in a water tank. When amplified, the perturbation wave rolls up to form discrete vortices in the region near the critical layer. Transition never takes place before the discrete vortices are formed. The initially straight discrete vortices deform into three-dimensional vortex loops by picking up pre-existing disturbances and amplifying their effects. When the two-dimensional vortices become stronger, regularity in the transverse direction in forming the vortex loops is quite marked.

James Forrestal Research Center, Princeton, U, N. J.
EXACT SOLUTIONS FOR THE ONE-DIMENSIONAL VISCOUS FLOW OF A PERFECT GAS, by Gerald Rosen. Rept. on Contract Nonr-1858(25). July 59, 26p. 4 refs. Proj. Squid Technical rept. PR-93-P.
Order from LC mi$2.70, ph$4.80 PB 147 066

Velocity-free equations are derived for the unsteady one-dimensional real fluid flow of a perfect gas. These equations admit a pressure-time symmetry, a stress symmetry, and a displacement symmetry. Fundamental solutions associated with each of the three symmetries are reported. (Author)

Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STABILITY OF A SUPERSONIC LAMINAR BOUNDARY LAYER ON A FLAT PLATE, by John Laufer and Thomas Vrebalovich. Rept. on Contract DA 04-495-ORD-18. 1 Dec 58, 60p. 26 refs. Rept. no. 20-116; AD-216 343.
Order from LC mi$3.60, ph$9.30 PB 147 482

Self-excited oscillations have been discovered experimentally in a supersonic laminar boundary layer along a flat plate. By the use of appropriate measuring techniques, the damping and amplification of the oscillation amplitudes were studied and the stability limits were determined at free-stream Mach numbers 1.6 and 2.2. The wave nature of these disturbances was demonstrated and the wave velocities were measured using a specially designed "disturbance generator." The amplitude distribution across the boundary layer of the various fluctuating quantities associated with the oscillations revealed large temperature fluctuations that were approximately twice the velocity fluctuations. In general, the experiments confirmed the predictions of the existing stability theory. (Author)

Laboratoire Mediterranéen de Recherches Thermodynamiques (France).
REALISATION OF A MOLECULAR GUN OR COSMIC WIND TUNNEL, by F. Marcel Devienne. Technical note on Contract AF 61(052)296. Oct 59, 60p. 11 refs. AFOSR-TN-59-1292.
Order from LC mi$3.60, ph$9.30 PB 146 134

This report describes the building conditions of a molecular gun, that is to say an apparatus by means of which it is possible to reproduce conditions to which a solid body, moving at a cosmic speed, in a rarefied gas, is submitted. The apparatus is based on the exchange momentum between two crossed beams, one of these being a molecular beam corresponding to an ordinary temperature, and the other an ion beam in which the ions are accelerated by voltages included between a few volts and a few hundred volts.

Massachusetts Inst. of Tech., Cambridge.
FORCES AND MOMENTS ON OSCILLATING SLENDER WING-BODY COMBINATIONS AT SUPERSONIC SPEED. PART II. APPLICATIONS AND COMPARISON WITH EXPERIMENT, by Haim Kennet, Holt Ashley, and Robert L. Stapleford. Rept. on Contract AF 18(600)961. Dec 57, 74p. 8 refs. Fluid Dynamics Research Group rept. no. 57-5; AFOSR-TN-58-114; AD-152 022.
Order from LC mi$4.50, ph$12.30 PB 147 041

Several applications and extensions are described of a theoretical method for estimating aerodynamic loads on slender wing-body configurations performing small oscillations of limited reduced frequency in a supersonic main stream. This procedure involves an iterative technique in ascending orders of aspect ratio and frequency, to similar shapes in transonic flow. The theory is moderately successful as compared against experimentally determined lift-and moment-curve slopes for a family of delta-wing-body combinations in steady flow. It provides reasonable estimates of the damping in pitch measured on a particular rocket model over a range of supersonic Mach numbers. When applied to a series of possible missile shapes with systematically varied wing planforms, it reveals a strong influence of planform geometry on damping in pitch which cannot be calculated by the conventional slender-body approximation. (Author)

Minnesota U., Minneapolis.
DAMPING OF RECTANGULAR PLATE VIBRATIONS, by T. S. Lundgren, C. C. Chang, and Y. C. Whang. Rept. for 11 June-30 June 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5426. Mar 60, 25p. 1 ref. WADC Technical rept. 59-544.
Order from OTS $0.75 PB 161 755

In Part A an analysis is made of the effect of an impact type damping mechanism on a vibrating square plate. The force which the damping mechanism exerts on the plate is idealized as a series of impulses acting at the center of the plate. It is found that the device analyzed does not make a very effective damper. In Part B an analysis is made of the effect of a damping device on the vibrations of a rectangular plate. The damper considered is a free piston in a closed cylinder which is attached to the center of the plate. When the leakage through the gap between the piston and the cylinder is small, the piston is caused to oscillate on the "spring" of air in the cylinder. It is found that this device can effectively damp out the resonant mode of the plate vibration. (Author)

National Research Corp., Cambridge, Mass.
MEASUREMENT OF GAS VELOCITY BY PULSED IONIZATION TECHNIQUE, by Robert A. Stauffer and Richard B. Lawrance. Final rept. on Contract N7onr 478. 31 May 51, 54p. 7 refs. ATI-108 550.
Order from LC mi$3.60, ph$9.30 PB 146 953

The report gives the results of a research program covering the application of electrification-marker techniques to the measurement of streaming gas velocity.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
BLOCKING IN THE OPEN-JET WIND TUNNEL, by Harold A. Mehaffey. Master's thesis. Oct 59, 57p. 4 refs. Technical rept. 388.
Order from LC mi$3.60, ph$9.30 PB 147 833

Criteria were established for the NSL, M = 4.80 open-jet wind tunnel. Two limits on model size and shape were found; (1) a maximum model frontal area; and, (2) a maximum bow shock strength independent of model frontal area. Additional factors affecting blocking were found to be stagnation pressure, stagnation temperature and diffusor efficiency. No method of evaluating these additional effects was found. The blocking criteria should be applicable for any continuous flow open-jet wind tunnel, with the limits determined by the particular tunnel circuit. (Author)

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
DESIGN, CALIBRATION AND ANALYSIS OF A HELIUM CONCENTRATION METER, by J. Richard Brown. Rept. on Contract AF 49(638)245. Dec 59, 32p. 7 refs. Technical rept. 416; AFOSR-TN-60-39.
Order from LC mi$3.00, ph$6.30 PB 147 782

The mass transfer investigation is concerned with the consequences of binary-mixture flow in the high speed boundary layer. Measurement of the boundary layer composition using a sound-speed concentration meter is an important part of the program. This report concerns the design, calibration and analysis of a helium concentration meter. It consists of the theory of operation and methods of calibration as well as the analysis and operational results obtained from a redesigned instrument.

Polytechnic Inst. of Brooklyn, N. Y.
THE INFLUENCE OF THE SHOCK CURVATURE ON THE BEHAVIOR OF HYPERSONIC BOUNDARY LAYER, by Antonio Ferri. Rept. on Contract AF 49(638)445. Feb 60, 47p. 15 refs. PIBAL rept. no. 542; AFOSR-TN-60-301.
Order from LC mi$3.30, ph$7.80 PB 147 044

For moderate values of Reynolds numbers the entropy gradients in the flow field affect the boundary layer in the region far from the nose. These effects are important for heat transfer, especially for a turbulent boundary layer. For moderate values of Reynolds numbers good results can be obtained by analyzing the boundary layer with correct local stagnation conditions and by neglecting the effect of velocity gradients outside the boundary layer. For lower Reynolds numbers, boundary layer type analysis can still be used; however, the effects of velocity gradients must be taken into account in stating the boundary conditions. The effect of vorticity in this case appears to be important.

Polytechnic Inst. of Brooklyn, N. Y.
SOME SIMILAR SOLUTIONS FOR INCOMPRESSIBLE LAMINAR BOUNDARY LAYER PROBLEMS, by Koon-Sang Wan. Rept. on Contract AF 49(638)445. Dec 59, 34p. 20 refs. PIBAL rept. no. 538; AFOSR-TN-59-1303.
Order from LC mi$3.00, ph$6.30 PB 146 768

Similar solutions to three types of laminar boundary layer problems are given in terms of known solutions The first problem pertains to unsteady laminar boundary layer when the external irrotational flow is inversely proportional to a linear function of time, and varies linearly in the direction of the main flow. The related heat transfer solution with isothermal heated surface is indicated. The second problem is the classical steady laminar boundary layer problem, but with the external irrotational flow given by $u_o (1+bx)^m$. The last problem is concerned with similar solutions for the boundary layer interacting with external inviscid rotational flow. A similar solution is obtained when the external vorticity is constant, large or small, and the external velocity varies as $U_o(1+bx)^{\frac{1}{3}} + \omega y$ or $U_o x^{\frac{1}{3}} + \omega y$. The latter case may be considered as a simple shear flow over a wedge with half wedge angle . (Author)

Princeton U., N. J.
INTERACTION OF A TURBULENT BOUNDARY LAYER WITH A STEP AT M = 3.85, by I. E. Vas and S. M. Bogdonoff. Rept. on Contract AF 18(600)498. Apr 55, 64p. 5 refs. Rept. no. 295; AFOSR-TN-55-200; AD-201 645.
Order from LC mi$3.90, ph$10.80 PB 146 008

Rensselaer Polytechnic Inst., Troy, N. Y.
AN INVESTIGATION OF THE COANDA EFFECT FOR SUPERSONIC FLOWS, by Kuo-Tai Yen. Rept. on Contract AF 18(600)992. 18 Mar 54, 35p. 8 refs. TR AE5405; OSR-TN-54-130; AD-45 023.
Order from LC mi$3.00, ph$6.30 PB 147 012

The purpose of this work is to study the feasibility of utilizing the Coanda Effect to improve the mixing and induction of supersonic flows. The problem studied here is the flow phenomenon of two supersonic streams as the result of inserting a curved surface into the primary stream. An approximate theory based on the Prandtl-Meyer flow is developed for the determination of the contact discontinuity between the two streams. The laminar mixing along the contact discontinuity is then studied. It is shown that the mixing of the two streams can be improved appreciably provided certain temperature and Mach Number conditions for these two streams are satisfied. (Author)

Southampton U. (Gt. Brit.)
THE CHOICE OF AN OPTIMUM SET OF MEASUREMENTS TO STUDY ATOMIC RECOMBINATION IN NOZZLES, by K. N. C. Bray and J. P. Appleton. Technical (scientific) note no. 1 on Contract AF 61(052)250. Nov 59, 45p. 16 refs. USAA Rept. no. 120.
Order from LC mi$3.30, ph$7.80 PB 146 915

This note is concerned with the accuracy of experiments designed to study the process of atomic recombination in a hypersonic wind tunnel nozzle. Three types of experiment are considered: (i) to determine whether a given flow is closer to the equilibrium or the frozen state, (ii) to determine the dissociation fraction in the test section of the nozzle, and (iii) to determine the recombination rate constant. It is shown that the overall accuracy of all these experiments, particularly the first one, is greatly affected by the choice of the various quantities to be measured, and in some cases errors of several thousand per cent are predicted. Recommendations are made for the choice of optimum measurements for recombination experiments.

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
LINEARIZED THEORY OF AIRFOILS IN FLUIDS OF LOW ELECTRICAL CONDUCTIVITY, by S. I. Pai. Rept. on Contract AF 04(647)269. Dec 59, 28p. Technical Information Series R60SD311.
Order from LC mi$2.70, ph$4.80 PB 147 298

A uniform steady flow of compressible fluid of low electrical conductivity past thin magnetized bodies has been studied. Because of the thinness of the body and the small electrical conductivity of the fluid, the fundamental equations of magnetogasdynamics may be linearized. The external electromagnetic fields are under the control of the designer of the aircraft and independent of the flying conditions. Hence we may use the electromagnetic fields as a control device for the aircraft flying in a fluid of low electrical conductivity. The effectiveness of this device is proportional to the magnetic parameter R_M. (Author)

Stanford Research Inst., Menlo Park, Calif.
AERODYNAMIC CHARACTERISTICS OF TRAILING-WIRE ANTENNAS AT SUPERSONIC SPEEDS, by F. B. Harris, Jr. Technical rept. 68 on Contract AF 19(604)3458. Mar 60, 88p. 12 refs. AFCRC-TN-60-198.
Order from LC mi$4.80, ph$13.80 PB 147 050

Severe difficulties associated with the design of satisfactory flush-type HF transmitting antennas for supersonic aircraft have prompted a reconsideration of trailing-wire antennas for such vehicles. The aerodynamic instabilities which caused mechanical failure of the trailing-wire type of antenna and led to its abandonment except in low-speed applications are carefully examined in this report.

University of Southern California. Engineering Center, Los Angeles.
A SEMI-AUTOMATIC McLEOD GAUGE, by Herbert R. Pass. Rept. on Contract AF 18(603)95. 31 Mar 60, 42p. 2 refs. USCEC rept. 56-211; AFOSR-TN-60-399.
Order from LC mi$3.30, ph$7.80 PB 147 299

A semi-automatic McLeod gauge has been designed and built for use in the USC low-density wind tunnel. The gauge is mounted inside the tunnel and is remotely controlled and remotely read. Control is obtained by means of an electro-pneumatic circuit using electrodes that are inserted through the glass walls; the reading is obtained electrically using a circuit consisting of, in part, a constant-current generator, tungsten wires that are placed in the bores of the capillaries, and a strip-chart recorder. The design is relatively simple, inexpensive, and reliable; although, operationally it is somewhat unwieldy. (Author)

Hydrodynamics, Hydraulics, and Hydrostatics

AER, Inc. [Pasadena, Calif.]
THE DESIGN OF THREE HORIZONTAL MOMENTUM EXCHANGE WATER BRAKES FOR THE U.S. NOTS 'SNORT' LIQUID ENGINE SLED, by R. E. Oliver. Rept. on Contract N123(60530)11868A. Dec 59, 114p. 5 refs. NOTS TP-2390; NAVORD rept. 7024.
Order from LC mi$6.00, ph$18.30 PB 146 921

Three momentum exchange water brakes were designed to produce decelerations of 10.0g ±1.0g, 5.0g ±0.5g, and 2.5g ±0.25g for sled weights of 4,254, 4,254 and 10,800 lb_w respectively, and water-contact velocities of 1,250, 1,250 and 636 ft/sec respectively. These decelerations were to be maintained until the sled velocity decreased to 300 ft/sec. The water surface profile was not specified beforehand, but was determined in conjunction with the design of the scoop shapes. One water surface profile was to be used for all three brakes. A primary consideration in the structural design of the brakes was simplicity. The stress analysis was carried out on the basis of a design stress of one-half the ultimate stress of the material (i.e., a safety factor of 2.0 based on ultimate strength). In order to provide an experimental check on the predicted forces on the brakes, force-measuring mounts were included in the design. (Author)

Aeronautical Accessories Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
DEVELOPMENT OF AGENT FLOW MEASUREMENT METHODS, by Ralph L. Hough and William R. Kane. Mar 60, 46p. 8 refs. WADC Technical note 59-183.
Order from OTS $1.25 PB 161 726

Instrumentation for measuring the rapidly changing flow of agent in fire-extinguishing systems was very limited, unrefined, or nonexistent. Highly transitory discharge, with abrupt beginning and end, occurs in these systems. Total discharge time covers only a few seconds. Methods were needed for measuring the average flow rate and the instantaneous velocity of the agent. Several instrument ideas were developed, instrument design engineering explored, and resultant techniques tested. A highly refined phase-change indicator was developed, capable of measuring initial agent velocity as well as average agent flow rate. Of the techniques examined for determining instantaneous velocity, using phosphor-decay rates appears most promising. Methods devised pertain not only to resolving problems in relation to fire-extinguishing systems, but to other problems concerning transient flow in hydrodynamic systems. (Author)

Brown U. Div. of Applied Mathematics, Providence, R. I.
SPHERICAL EXPLOSIONS IN SEA WATER, by S. A. Berger and M. Holt. Technical rept. no. 19 on Contract Nonr-562(07). Apr 59, 158p. 60 refs. Rept. 562(07)/19.
Order from LC mi$7.50, ph$24.30 PB 146 053

In this report the field of disturbance due to the detonation of a bared spherical charge of PETN in sea water is calculated. The equations of unsteady motion of a compressible fluid with spherical symmetry are written in Eulerian form and integrated numerically by the method of characteristics. Three distinct regions have to be considered, the compressed water region behind the main blast wave, the region of expansion of the detonation products, and the explosive gas region between the outer boundary of this expansion, which develops into a second shock wave, and the boundary of the gas bubble. Special attention is given to fitting the boundaries of these regions, the outer boundary of the detonation region, the second shock wave, gas-water contact discontinuity and main blast wave. A Jones equation of state is used in the product gases and a Tait equation of state is used in sea water.

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
STUDY OF HYDROFOIL SEACRAFT. Phase I technical rept. on Contract MA-1730. 3 Oct 58, 451p. 51 refs.
Order from OTS $6.00 PB 161 759

Contents:
Part 1. Subcavitating hydrofoils
Part 2. Supercavitating hydrofoils
Part 3. Struts and bodies of revolution
Part 4. Hydrofoil and strut weight estimation
Part 5. Hydrofoil configurations
Part 7. Main power plant
Part 8. Propulsion devices and transmissions
Part 9. Hull structural design
Part 10. Operational aspects
Part 11. Determination of optimum craft characteristics
Part 12. Preliminary designs
(See also PB 151 475)

Hydrodynamics Lab., Mass. Inst. of Tech., Cambridge.
RESISTANCE COEFFICIENTS FOR ACCELERATED FLOW THROUGH ORIFICES, by James W. Daily and Wilbur L. Hankey, Jr. Technical rept. no. 10 on Contract N5ori-07826. Oct 53, 23p. 10 refs. AD 28 572.
Order from LC mi$2.70, ph$4.80 PB 147 157

The investigation of fluid friction in unsteady motion was extended to include the frictional resistance caused by orifices in accelerated flow. Two different orifices were investigated, each located in a region of fully developed conduit boundary layer and velocity profile. Orifices of area ratios 0.5 and 0.7 were installed 38.5 diameters from the entrance nozzle in a 1-in. -diam tube, and the velocity and acceleration of flow were programmed by a servomechanism controlling the pressure difference between the supply and receiving tanks of the water tunnel. The tests covered a conduit Reynolds number range from 5×10^4 to 3×10^5 and accelerations up to 35 ft/sec/sec. The results showed that (1) the coefficient of head drop is independent of the Reynolds number and is a function of the acceleration parameter; (2) the frictional resistance for a given instantaneous velocity of

flow through an orifice is appreciably less than for steady flow at the same velocity; and (3) the frictional resistance for a given instantaneous velocity of accelerated flow through an orifice decreases with increasing acceleration. A reanalysis was made of previous measurements with a clear conduit, and this analysis indicated that (1) the coefficient of head drop is a function of the Reynolds number as well as the acceleration parameter; and (2) the frictional resistance for a given instantaneous velocity of accelerated flow through a uniform diameter smooth tube is equal to or possibly slightly greater than that for steady flow at the same velocity.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
CYLINDRICAL SHOCK WAVES PRODUCED BY INSTANTANEOUS ENERGY RELEASE IN MAGNETOGAS DYNAMICS, by S. I. Pai. Rept. on Contract AF 18(600)993. Feb 58, 32p. 4 refs. Technical note BN-120; AFOSR-TN-58-215; AD-154 116.
Order from LC mi$3.00, ph$6.30 PB 147 454

The behavior of a cylindrical shock wave produced by instantaneous energy release along a straight line of infinite extent in a conducting gas subjected to a mag netic field with circular lines of force has been analyzed. Initially the gas is at rest and has constant temperature. Both the initial density and the initial magnetic field H_{Θ_0} are assumed to be inversely proportional to some power of the radial distance r. It was found that similar solutions exist only if H_{Θ_0} is proportional to $1/r$. Similar solutions for various initial density distributions have been obtained. Numerical examples are given for constant initial density. The magnetic field has great influence on the pressure distribution but little influence on the density distribution within the shock. The pressure near the shock front is increased by the magnetic field while that near the center of the region is decreased. In general, the magnetic field increases the flow velocity within the cylindrical shock. (Author)

Jet Propulsion Center, Purdue U., Lafayette, Ind.
A STUDY OF THE MEAN THICKNESS OF THE LIQUID FILM AND THE CHARACTERISTICS OF THE INTERFACIAL SURFACE IN ANNULAR, TWO-PHASE FLOW IN A VERTICAL PIPE, by D. A. Charvonia. Interim rept. no. 59-1 on Contracts Nonr-1100(14) and N6ori-105(03). May 59, 266p. 35 refs. Proj. Squid Technical rept. PUR-39-T-R.
Order from LC mi$11.10, ph$41.10 PB 145 908

An experimental investigation of annular, two-phase flow was conducted in a vertical tube, 2.498 in. ID and 28 in. long, employing water and air at ambient temperatures and pressures as the liquid and gaseous media respectively. An analysis of downward, annular, two-phase flow is presented and the results of that analysis are compared graphically with those from the experimental investigations. The experimental studies were concerned with extremely thin liquid films. The results of the investigation indicate that the amplitudes and frequencies of the interfacial waves are related by definite spectra. The analysis provides a method for predicting the mean liquid film thickness and pressure gradient in the gas stream in downward, annular, two-phase flow if the rates of flow of the two fluid media, their physical properties, and the pipe diameter are known.

Naval Ordnance Test Station [China Lake, Calif.]
ON THE MOTION OF VORTICES BEHIND A CIRCULAR CYLINDER, by I. Michelson. 29 Oct 51, 26p. 9 refs. Technical memo. 377.
Order from LC mi$2.70, ph$4.80 PB 146 945

The flow of a uniform stream of perfect (i.e., incompressible and inviscid) fluid past a circular cylinder and two nearby complex, vortex-line singularities is considered. For the most part, interest is confined to the flow in which the singularities are symmetrically situated downstream of the cylinder. The classical methods of potential theory are applicable to the study of the resulting unsteady motion, and a large amount of information is thus obtained concerning the kinematics of the entire motion as well as the forces and pressures which act on the cylinder.

METALLURGY

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF PARTIALLY VOLATILE BRAZING FILLER ALLOY FOR HIGH-TEMPERATURE APPLICATION AND RESISTANCE TO OXIDATION, by William M. Lehrer and Harry Schwartzbart. Rept. for 1 Apr 58-31 Mar 59 on Metallic Materials, Contract AF 33(616)5654, continuation on Contract AF 33(600)33406. Dec 59, 45p. 7 refs. WADC Technical rept. 59-404; AD-232 969.
Order from OTS $1.25 PB 161 746

Experimental brazing filler alloys have been developed containing temperature depressants which have been volatilized during the brazing of stainless steel, leaving joints of high remelt temperature. The mechanisms by which remelt temperature is increased have been studied for the range of alloys investigated which contained nickel, chromium, germanium, iron, lithium, and phosphorus. The two main mechanisms are (i) dissolution of the base metal in the filler metal and diffusion of constituents of the filler metal into the base metal and (ii) volatilization of the filler metal constituents. It has been shown theoretically and experimentally that in order for remelt temperature to increase there must be solid solubility of the diffusing or volatile element in the filler alloy. (Author)

Bell Aircraft Corp. [Buffalo, N. Y.]
MECHANICAL PROPERTIES OF SELECTED ALLOYS AT ELEVATED TEMPERATURES, PART I, by Harry A. Pearl, George F. Kappelt, and Edmund J. King. Rept. for July 58-Sep 59 on Materials Application, Contract AF 33(616)5760. Mar 60, 268p. WADC Technical rept. 59-702, Pt. 1.
Order from OTS $4.00 PB 161 761

Six materials in plate and bar form were subjected to tension, compression, bearing, and shear stresses at various temperatures after exposure times of 1/2, 10, 100, and 1000 hours at selected test temperatures. The materials studied and the temperature range of testing were: AM 355 - R. T. - 1000°F, PH 15-7M° - R. T. - 1000°F, HK31-H24 - R. T. - 600°F, A 286 - R. T. - 1200°F, Udimet 500 - R. T. - 1700°F and Inconel X - R. T. - 1500°F. In general the test results show that most of the material properties regardless of the type of stress imposed decrease with temperature and time. Time of exposure was not as effective in lowering the properties as the temperature. The A 286 alloy did show mechanical properties higher after prolonged exposure due to aging at some temperatures. The sharp drop off in properties that the other alloys exhibited at the higher temperatures was not characteristic of the A 286 alloy. Comparisons between alloys are made only where the temperature range of operation is common to both. (Author)

Cloud Physics Lab., U. of Chicago, Ill.
RANDOMIZED SEEDING OF OROGRAPHIC CUMULUS, 1957: PART I, by Louis J. Battan and A. Richard Kassander (U. of Arizona). Rept. on Contracts AF 19(604)1388 and NSF Grant G-4175. 15 Feb 58, 22p. 3 refs. Cloud Physics Lab. Technical note no. 12.
Order from LC mi$2.70, ph$4.80 PB 137 727

This report deals with a description of the design of the experiments and a summary of the analysis of the rain gage data. During the summer of 1957 there were 16 pairs of days studied. The analysis suggests that seeding had a positive effect, but statistical tests show that the differences between the rainfall on seeded and non-seeded days could not be shown to be statistically significant at an acceptable confidence level.

General Mills, Inc., Minneapolis, Minn.
ELECTRON MIRROR MICROSCOPY IN MAGNETIC AND METALLURGICAL STUDIES, by Ludwig J. Mayer. Final rept. for 1 Oct 57-30 Sep 59 on Contract AF 33(616)3852. Oct 59, 81p. 46 refs. WADC Technical rept. 59-640.
Order from OTS $2.25 PB 161 710

Electron mirror microscopy (EMM) can be utilized for the observation of magnetic patterns recorded on magnetic tapes. EMM reveals magnetic domain patterns in magnetic materials with a uniaxial direction of easy magnetization and in materials with several directions of easy magnetization exhibiting basically flux closure domain configurations. On silicon-iron three types of domain manifestations were observed. Motion pictures photographed directly from the screen of the electron mirror microscope portray quite adequately the domain patterns set in motion by applied magnetic fields. EMM is particularly well suited for direct visual observation of magnetic stray fields at grain boundaries. It is also possible to observe domain and domain movement in the different types of thin magnetic films. A method of magnetic writing is possible which is based on a local reversal of the direction of magnetization in suitable premagnetized film by temporarily elevating the temperature above the Curie point. By utilizing the dissipation energy of a focused electron beam for this purpose quite well defined traces of reversed magnetization could be recorded on MnBi films. These traces were magnetically erasable. Writing speeds of 3×10^4 bits/sec and information densities of 10^5 bits/cm^2 could be achieved. With a newly designed vacuum hot stage, the formation of MnBi films was observed by means of the Kerr magneto-optic effect, thus achieving for the first time visual observation of the nascent state of ferromagnetism. Experiments showed that uniform MnBi films grow from only a few randomly distributed nucleation spots.

Grumman Aircraft Engineering Corp., Bethpage, N. Y.
EVALUATION OF TITANIUM SHEET ALLOYS, by Francis X. Drumm. Quarterly progress rept. no. 3, 1 July-30 Sep 58, on Contract NOas-58-100C. 30 Oct 58, 31p. Rept. R 82053013.3.
Order from LC mi$3.00, ph$6.30 PB 137 867

Progress consisted of preliminary manufacturing evaluation, which included bend testing, adhesive bonding, dimpling and resistance spot welding. The effect of elevated temperatures upon solution heat treated material was investigated.

Illinois U., Urbana.
PROTECTIVE COATINGS FOR REFRACTORY METALS, by Clifton G. Bergeron, Arthur L. Friedberg and others. Rept. for June 58-Aug 59 on Ceramic and Cermet Materials, Contract AF 33(616)5734. Jan 60, 50p. 45 refs. WADC Technical rept. 59-526.
Order from OTS $1.25 PB 161 739

Tests with tungsten wire encapsulated in evacuated fused silica tubes demonstrated the impermeability of oxygen at temperatures above 3000°F. for several hours, as evidenced by the non-oxidation of the encased tungsten. Preliminary experiments showed that oxygen-free atmospheres, but not high vacuum conditions, were required for successful application of ceramic coatings on tungsten. Vitreous-bonded coatings, consisting of zircon and a low expansion refractory glass, protected tungsten wire specimens at temperatures of 3600°F. for 3-1/2 hours using a direct resistance heating test. Combinations of silicide and vitreous-bonded coatings, SiO coatings, and flame-sprayed coatings were investigated. (Author)

Naval Engineering Experiment Station, Annapolis, Md.
INVESTIGATION OF HIGH-TEMPERATURE NOTCH SENSITIVITY IN A LOW-CARBON CR-MO-V PIPING STEEL, by R. B. Niederberger. 24 Mar 59, 22p. 16 refs. Research and Development rept. 910038E; AD-215 987.
Order from LC mi$2.70, ph$4.80 PB 147 483

Notched and smooth bar rupture data, at temperatures of 1000° and 1100°F and times up to several thousand hours, are presented for a low-carbon Cr-Mo-V steam piping steel. It was found that notch sensitivity was dependent on stress as well as rupture time and temperature.

New York U. Coll. of Engineering, N. Y.
DEVELOPMENT OF PROTECTIVE COATINGS FOR REFRACTORY METALS, by C. G. Goetzel, P. S. Venkatesan, and R. F. Bunshah. Rept. for 1 June 58-31 May 59 on Ceramic and Cermet Materials, Contract AF 33(616)5735. Feb 60, 57p. 44 refs. WADC Technical rept. 59-405.
Order from OTS $1.50 PB 161 736

A preliminary study of the feasibility of protecting tungsten against oxidation at 1650°C (3000°F) was undertaken. Rhodium was selected from the noble metal group as the most promising metallic type of coating. It was applied by electrolytic deposition, either directly onto thoriated or pure tungsten wires, or onto intermediate coats containing the elements rhenium, chromium and silicon. These sub-coats served several purposes, such as: (1) providing a layer of intermediate expansion characteristics between those of the substrate and the rhodium coat; (2) modifying the oxides formed on the surface of the substrate; or (3) promoting the formation of liquid phases at the surface that would freely flow and seal exposed areas of the substrate.

Ferrous Metals

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
WELDING OF HIGH-STRENGTH STEELS FOR AIRCRAFT AND MISSILE APPLICATIONS, by H. W. Mishler, R. E. Monroe, and P. J. Rieppel. Rept. on Contract AF 18(600)1375. 12 Oct 59, 93p. 43 refs. DMIC rept. 118; AD-228 629.
Order from OTS $2.25 PB 151 074

This report summarizes the materials and procedures currently being used in the aircraft and missile industry to arc and resistance weld high-strength steels. The steels discussed are (1) low-alloy martensitic steels, (2) hot-work die steels, (3) martensitic stainless steels, and (4) precipitation-hardening stainless steels. For each class of steel, welding techniques and procedures are discussed, arc-welding filler materials are described, and mechanical properties of arc and resistance welds are listed. A discussion is included of design, testing, and inspection techniques as applied to weldments made from these high-strength steels. (Author)

Naval Research Lab., Washington, D. C.
CRACK PROPAGATION TESTS OF HIGH-STRENGTH SHEET MATERIALS. PART IV. THE EFFECT OF WARM PRE-STRAINING, by J. E. Srawley and C. D. Beachem. 18 Apr 60, 20p. 5 refs. NRL Rept. 5460.
Order from OTS $0.50 PB 161 355

Evidence is presented that the weakening effect of the cracks provided in crack-propagation test specimens of high-strength sheet steels may be substantially mitigated by straining at moderately elevated temperatures, where the mode of fracture is entirely shear, before testing at lower temperatures. The improvement in load-bearing capacity of the specimens resulting from the pre-straining treatment is greater the lower the testing temperature. The effect is believed to be mainly a result of blunting of the crack fronts in the vicinity of the specimen surfaces by plastic flow and shear cracking during pre-straining. It might be of some practical value in reducing the effective severity of undiscovered cracks in certain thin-walled structures, thus improving the integrity of such structures. (Author) (See also PB 151 770)

Nonferrous (except light) Metals

Army Signal Research and Development Lab., Fort Monmouth, N. J.
INVESTIGATION OF COLUMBIUM AS AN ELECTROLYTIC CAPACITOR ANODE, by Clyde Peabody and Albert Lunchick. 15 Aug 59, 17p. 1 ref. USASRDL Technical rept. 2069; AD-226 038.
Order from LC mi$2.40, ph$3.30 PB 146 935

The metal columbium was studied as an electrolytic capacitor anode. Samples of columbium anodes both in unetched foil and sintered pellet form were anodized and compared with tantalum controls. Higher capacitance values for the columbium electrolytics were observed, but the capacitance gain promised by the higher dielectric constant of columbium oxide was not fully realized due to the thicker columbium oxide films. For similar density ratios of columbium and tantalum sintered pellets, however, better than 80% capacitance gain per unit volume was realized with columbium. Wet dissipation factors of columbium specimens were similar to those for tantalum. The d. c. leakages of the former were higher, although still well within practical limits. (Author)

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
OXIDATION BEHAVIOR AND PROTECTIVE COATINGS FOR COLUMBIUM AND COLUMBIUM-BASE ALLOYS, by W. D. Klopp. Rept. on Contract AF 18(600)1375. 15 Jan 60, 97p. 63 refs. DMIC Rept. 123.
Order from OTS $2.25 PB 151 080

Available information on the oxidation behavior of and protective coatings for columbium and columbium-base alloys is summarized and discussed. Unalloyed columbium forms a tarnish film and reacts parabolically with air or oxygen up to about 450 C. In this temperature range the protective film blisters and unprotective, white Cb_2O_5 forms. Oxidation behavior is linear after formation of Cb_2O_5, the rate increasing appreciably with increasing temperature. Cb_2O_5 is solid to 1500 C. Binary additions which improve the oxidation resistance include Ti, Zr, Mo, W, Cr, and V. Ti and Zr also improve the contamination resistance of columbium. Ternary and higher alloying produces further significant improvements in oxidation behavior by promoting formation of complex oxide scales. Several of the best systems are Cb-Cr-Al, Cb-Fe-Al, Cb-Mo-Al, Cb-Ti-Al, and Cb-Ti-Cr. Improvements up to 1000-fold over unalloyed columbium are possible, but the most oxidation-resistant alloys are unfabricable. Information on protective coatings for columbium is limited. The best coatings to date appear to be a duplex LM-5 coating and a modified Ni-C coating. (Author)

Armour Research Foundation, Chicago, Ill.
A STUDY OF TERNARY PHASE DIAGRAMS OF TUNGSTEN AND TANTALUM, by W. Rostoker. Rept. for 1 Apr 58-31 July 59 on Metallic Materials, Contract AF 33(616)5678. Mar 60, 93p. 41 refs. WADC Technical rept. 59-492.
Order from OTS $2.25 PB 161 709

Phase relationships in 36 ternary refractory metal systems were investigated. Some 28 related binary systems were first established by reviewing the literature and doing whatever supplementary experimental work necessary to assure a valid basis for the ternary studies. Nearly 200 ternary alloy compositions were prepared from high-purity alloying ingredients by nonconsumable electrode arc-melting procedures. These alloys were studied metallographically in the as-cast condition as well as after annealing at and quenching from 1500 and 1000°C. The main purpose of this effort was to scan the solid solubility limits of ternary systems based on tungsten and/or tantalum and involving the following metals: molybdenum, niobium, vanadium, chromium, osmium, and rhenium. The diagrams presented herein are intended to serve as a foundation for future alloy development. Because none of the systems presented is completely detailed, definitive work can and should be done as the specific need arises. (Author)

Ballistic Research Labs., Aberdeen Proving Ground, Md.
AN INVESTIGATION OF THE STRUCTURE OF COPPER AFTER EXPOSURE TO VERY INTENSE STRESS WAVES, by G. Moss and C. Glass. Feb 60, 19p. 12 refs. BRL memo. rept. 1248.
Order from LC mi$2.40, ph$3.30 PB 147 490

X-ray diffraction techniques were used to examine an explosively loaded copper single crystal for presence of macro-twins and kink bands. The results did not indicate the presence of mechanical macro-twins, but instead kink bands which are commonly found in slowly deformed copper. (Author)

Battelle Memorial Inst., Columbus, Ohio.
INVESTIGATION OF THE PROPERTIES OF TANTALUM AND ITS ALLOYS, by Frank F. Schmidt, William D. Klopp and others. Rept. for 1 May 58-31 Dec 59 on Metallic Materials, Contract AF 33(616)5668. Mar 60, 112p. 53 refs. WADD Technical rept. 59-13.
Order from OTS $2.50 PB 161 758

The reactions of unalloyed tantalum with air, nitrogen, and oxygen were studied. Vacuum sintering of high-purity and high-impurity-content tantalum powders was investigated to determine the conditions required for purification. The effects of alloying on the oxidation behavior of tantalum were determined. Several alloying elements were found to be effective in reducing both scaling and contamination. Interstitials were studied for their effects on mechanical behavior at low and elevated temperatures. Screening studies were conducted on the effects of substitutional alloying on mechanical properties at room temperature and at 2200°F. References are included. (Author)

Birmingham U. (Gt. Brit.)
THE MIGRATION OF GRAIN BOUNDARIES IN METALS UNDER THE INFLUENCE OF A TEMPERATURE GRADIENT, by R. W. Cahn and R. W. Lucas. Technical summary rept. for Oct 56-Oct 58 on Contract AF 61(514)1020. [1958] 40p. 11 refs. AFOSR-TN-58-1056; AD-206 941.
Order from LC mi$3.00, ph$6.30 PB 146 844

Columbia U., New York.
CREEP AND PLASTIC DEFORMATION IN CYLINDRICAL SHELLS, by Alfred M. Freudenthal and Maciej P. Bieniek. Rept. for Dec 58-May 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)6112. Mar 60, 21p. 2 refs. WADC Technical rept. 59-399.
Order from OTS $0.75 PB 161 706

In the first part of this report, the problem of creep deformation and bending moments in the vicinity of a freely supported or fixed end of a long, cylindrical shell is solved under conditions of stationary (second stage) creep, using an approximate method based on extremum principles of dissipative media which are valid for the assumed uni-axial and non-linear creep-law $\dot{\varepsilon} = K\sigma^n$. The results of analysis are checked by experiment. In the second part of this report results of tests of steel cylinders under internal pressure, producing large plastic deformation, are given, illustrating the relation between problems of non-linear creep and plastic deformation. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
ALUMINUM ALLOY CORROSION EVALUATION, by Franklin J. Gillig. Final rept. on Contract NObs-72056. 30 Sep 58, 26p. 1 ref. Rept. no. KC-1042-M-11; AD-213 449.
Order from LC mi$2.70, ph$4.80 PB 147 018

Five aluminum alloys 5154, 5356, 6063, 6061 and 5083 were evaluated to determine the effects of possible aircraft carrier deck environments on their mechanical properties and corrosion resistance. The environments included intermittent and continuous exposures to temperatures between 100°F and 1000°F. Mechanical property, intergranular corrosion, and stress corrosion data are given. No difference in the effect of intermittent and continuous exposures to a given temperature was found as long as the cumulative time at temperature was the same. Stress corrosion failures were encountered only in the 5083 alloy exposed to 300°F for 150 hours. (Author)

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
INVESTIGATION OF THE COMPRESSIVE, BEARING, AND SHEAR CREEP-RUPTURE PROPERTIES OF AIRCRAFT STRUCTURAL METALS AND JOINTS AT ELEVATED TEMPERATURES, by Luke A. Yerkovich.

Rept. for 1 June 58-31 July 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5772. Mar 60, 111p. 6 refs. WADC Technical rept. 59-572.
Order from OTS $2.50 PB 161 717

This report summarizes in tabular and chart form the high temperature short time deformation properties of 16 V- 2.5 Al titanium alloy and Vascojet 1000 alloy steel in tension, compression, bearing and shear. In addition, correlations of the tensile creep-rupture properties with corresponding compression, bearing and shear creep-rupture properties are presented. The creep-rupture characteristics of single-rivet lap type joints and two-rivet doubler type joints prepared from the test alloys are presented. Correlations between measured joint creep-rupture and predicted joint creep-rupture are included. (Author)

Dayton U. Research Inst., Ohio.
FURTHER INVESTIGATION OF THE EFFECTS OF MOLTEN BORON OXIDE ON HIGH TEMPERATURE MATERIALS, by Joseph W. Rosenbery. Rept. on Aviation Fuels, Contract AF 33(616)3898. Jan 60, 102p. 11 refs. WADC Technical rept. 59-205.
Order from OTS $2.50 PB 161 703

The corrosion resistance of a group of high temperature materials, typical of those available for use in aircraft power plants, was evaluated in a boron oxide environment. Exposure consisted of cyclic immersion in B_2O_3 at temperatures of 1750° - 2200°F. for periods up to 145 hours in an air atmosphere. The results indicate aluminum, manganese, and carbon as alloy constituents are detrimental to corrosion resistance, while Si appears to produce beneficial effects. Several possible mechanisms of attack by molten boron oxide are postulated to explain the data.

Denver Research Inst., Colo.
DEVELOPMENT OF A COPPER-BASE CERMET BY THE MELT-SATURATION METHOD, by Leonard E. Olds. Summary rept. for 5 Dec 56-5 Aug 57 on Subcontract MOSD 60145 to Contract AF 04(645)24. 15 Aug 57, 33p. 10 refs.
Order from LC mi$3.00, ph$6.30 PB 147 737

The melt-saturation method is a process of forming a ceramic compound in a metal by precipitating the compound from a liquid solution. This report describes the preparation by this method of copper alloys nominally containing 0.5, 1, 2, and 4 percent ThB_4. Significant improvements were obtained in elevated temperature strengths, the Cu-4% ThB_4 alloy having almost four times the strength of pure copper at 1800°F. The ductility loss associated with this strengthening was approximately 30 to 40 percent. Metallographic and X-ray diffraction examinations indicated that both the ThB_4 and the ThB_6 phases were precipitated from the copper melt. The strengthening of the alloys by these phases appears to be associated with the formation submicroscopic borides even though all of the alloys prepared for this study contained massive borides with variable amounts of segregation. Attempts were made to measure the thermal diffusivity of the alloys; however, the tests were made under conditions which led to unreliable results. Some evidence was obtained to indicate an unbalance in alloy composition with a resulting excess of either boron or thorium in solid solution. Under such conditions the thermal conductivity of the alloys would be low. (Author)

Digital Computer Lab., U. of Illinois, Urbana.
CALCULATION OF ORDER PARAMETERS IN A BINARY ALLOY BY THE MONTE CARLO METHOD, by Lloyd D. Fosdick. Rept. on Contract Nonr-1834(27). 7 Apr 59, 27p. 12 refs. Rept. no. 87.
Order from LC mi$2.70, ph$4.80 PB 146 033

A sampling scheme used by others in equations of state computations for gases has been used to investigate order-disorder phenomena in a face-centered cubic A_3B alloy, Cu_3Au.

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
DISLOCATIONS IN DEFORMED SINGLE CRYSTALS OF α-BRASS. PART II. PILE UPS, by J. D. Meakin and H. G. F. Wilsdorf. Rept. on Contract AF 49(638)162. Feb 60, 29p. 20 refs. Interim rept. I1A2027-2; AFOSR-TN-60-4.
Order from LC mi$2.70, ph$4.80 PB 147 282

An etching technique has been used to investigate the dislocation structure of deformed alpha brass single crystals. Divergences between the experimental and theoretical spacings in the isolated pile-ups and the origin of the stress maintaining the pile-ups are discussed. (See also PB 144 570)

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
THIN METAL FILMS AS CORROSION INDICATORS, by Richard B. Belser and Niels Engel. Rept. for 15 Nov 58-31 Dec 59 on Finishes and Materials Preservation, Contract AF 33(616)3879. Mar 60, 74p. 12 refs. WADC Technical rept. 59-759.
Order from OTS $2.00 PB 161 757

Thin metal films were evaluated as corrosion indicators for packages. Over 500 films deposited on glass substrates were examined by exposure in sealed containers at 25°C and at known relative humidities of from 0 to 70 percent. Iron, copper, manganese, magnesium and bimetal iron-copper films were studied. Although pure metal films did not corrode to a significant degree at 70% R. H. additions of sensitizing materials such as acid fumes or inorganic salts to the films caused them to deteriorate rapidly at these conditions. Such sensitization occurred inadvertently during specimen preparation unless suitable precautions were taken. (Author)

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
THE PROPERTIES OF METALS AND ALLOYS OF PARTICULAR INTEREST IN PRECISION INSTRUMENT CONSTRUCTION; COMPILATION OF DATA FROM VARIOUS HANDBOOKS AND OTHER

SOURCES, by L. M. Schetky. Rept. on Contract AF 33(616)2039. Jan 57, 42p. Rept. R-137; AD-144 130.
Order from LC mi$3.30, ph$7.80 PB 147 266

The present compendium is a selection of values felt to be the best available at this date. In several classes of alloys the properties will vary widely with heat treatment and method of fabrication. As a criterion for selection of a material destined for use in restricted space or under conditions calling for low weight, the parameter strength-to-weight ratio is often used; in the field of precision instruments this is a misleading guide, since for reasons of dimensional stability it is desirable to operate well within the stress level of the elastic limit. In this list of properties is a value for the elastic limit/density ratio and also the ratio of the modulus of elasticity to density. Tables include a list of moduli of the elements in order of their increasing magnitude, and with this the best value available for Poisson's ratio. A second list indicates the nature of the temperature coefficient of modulus for several structural alloys. (Author)

Mallory-Sharon Metals Corp., Niles, Ohio.
THE MANUFACTURE OF HEAT TREATABLE Ti6Al-4V AND Ti-2.5Al-16V TITANIUM SHEET, by Paul E. Moorhead. Bi-monthly progress rept. no. 9, 25 Nov 57-25 Jan 58, on Contract NOa(s) 56-994-c. 30 Jan 58, 29p. Rept. 4000P-70; AD-157 743.
Order from LC mi$2.70, ph$4.80 PB 147 766

The chemical analyses and mechanical properties of solution treated and of age hardened 2.5 Al-16V Ti alloy sheet are tabulated. A solution treatment temperature of 1380°F for 1/2 hr followed by water quenching gave satisfactory results. An aging temperature of 960°F (4 hr) produced higher yield and ultimate tensile strengths with lower elongations than an aging temperature of 975°F (4 hr). The effects of straining of solution treated sheet (1400°F) on the mechanical properties after aging were investigated and the results are tabulated. The hydrogen pickup of 2.5 Al-16V Ti alloy sheet during solution treatment was minimized by a ceramic coating, but the same protection was not obtained by 6 Al-4V Ti alloy sheet. The results of welding studies indicate that 2.5 Al-16V Ti alloy may yield usable mechanical properties after welding; the tension/shear ratio of age hardened sheet is nearly twice that of other Ti alloys. The mechanical properties of the 6 Al-4V Ti sheet production in the anneal condition are tabulated. Four sheets (0.040 x 48 x 96 in. nominal) of 6 Al-4V were rolled, and the rolling of sheets wider than 36 in. appears to be feasible on present mill equipment.

Massachusetts Inst. of Tech., Cambridge.
SOLID SOLUTION AND SECOND PHASE STRENGTHENING OF NICKEL ALLOYS AT HIGH AND LOW TEMPERATURES, by Regis M. N. Pelloux (Doctoral thesis) and Nicholas J. Grant. Technical rept. on Contract Nonr-1841(28). [1959] 22p. 10 refs.
Order from LC mi$2.70, ph$4.80 PB 146 032

Alloys in the systems Ni-Cr, Ni-Mo, and Ni-W, were prepared as vacuum melted alloys. Tensile tests at room temperature and stress rupture tests at 1200° and 1500°F were run for time periods to give fracture in 0.1 to 500 hours. Observations were made of solid solution and second phase strengthening or weakening, coupled with studies of ductility and the role of structure on the noted behavior patterns.

Michigan U., Ann Arbor.
THE EFFECT OF TENSILE STRESS ON DIHEDRAL ANGLES IN LEADED COPPER, by C. A. Stickels and E. E. Hucke. Rept. on Contract AF 49(638)422. 31 Mar 60, 29p. 8 refs. AFOSR-TN-60-385.
Order from LC mi$2.70, ph$4.80 PB 147 004

Experiments were conducted to determine the effect of applied stress on dihedral angles of liquid lead in copper at 900°F. It was found that dihedral angles decrease with increasing stress in the center of test specimens, but that no apparent relation exists between the amount of stress applied and the dihedral angle observed nearer the surface of the specimen. The latter phenomena is attributed to oxygen penetration which changes angles by adsorption on interfaces. It was observed that stress levels resulting in specimen fracture were accompanied by migration of lead to the specimen surface and the fracture surface. A mechanism for this movement is postulated. (Author)

[Naval Engineering Experiment Station] Annapolis, Md.
SEA WATER CORROSION TEST OF STAINLESS STEEL AND NICKEL BASE ALLOY CONDENSER TUBES, by F. Sutton. 5 Jan 59, 12p. 3 refs. Research and Development Rept. 910027B; AD-214 445.
Order from LC mi$2.40, ph$3.30 PB 147 380

Plain condenser tubes of austenitic stainless steels and nickel base alloys were tested at the Harbor Island Test Station in two model condensers of 20 tubes each. Natural sea water was pumped through the tubes at a velocity of 10 ft/sec. The condensers were operated on a 30-day "off-on" cycle during part of the test. All of the stainless steels were susceptible to pitting. Type 347 was damaged most, and Type 316 the least of the steels tested. There were no failures or serious deterioration of the nickel base alloy tubes. A Ni-CR-Fe alloy was the least affected of the nickel alloys. (Author)

Office of Technical Services, Dept. of Commerce, Washington, D. C.
CORROSION (TEN YEAR BIBLIOGRAPHY). Dec 59, 39p. 1004 refs. OTS Selective Bibliography 401.
Order from OTS $0.10 OTS SB-401

A bibliography of reports listed in the two OTS monthly abstract journals: U. S. Government Research Reports and Technical Translations. The information is arranged in groupings of PB reports, AEC reports, and translations in sections as follows: corrosion resistant coatings, corrosion resistant materials, stress corrosion, corrosion tests and testing equipment, and corrosion, general, including galvanic corrosion, corrosive effects of materials, etc.

Rock Island Arsenal Labs., Ill.
AN EVALUATION OF VOLATILE CORROSION INHIBITED OILS FOR THE INTERNAL PRESERVATION OF MACHINE TOOLS IN UNCONTROLLED STORAGE, by Robert E. Johnson. 13 Nov 59, 24p. 7 refs. Rept. no. 59-2929. AD-232 438L.
Order from LC mi$2.70, ph$4.80 PB 146 838

After two years in uncontrolled storage, five volatile corrosion inhibited (VCI) oils and three grades of conventional preservative oil were evaluated to determine their comparative protective ability for the internal protection of machine tools. It was found that MIL-C-14201A Grade 1 material was most suitable for the external preservation of machine tools in uncontrolled storage.

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF Pd_3Si, by B. Aronsson and Anna Nylund. Technical note no. 9 on Contract AF 61(052)40. 7 Jan 60, 17p. 19 refs. AFOSR-TN-59-1269; AD-233 277.
Order from LC mi$2.40, ph$3.30 PB 146 129

The crystal structure of Pd_3Si has been established from single crystal data. The space-group is Pnma, and there are four formula units in the elementary cell which has the dimensions $a = 5.735$ Å, $b = 7.55$Å, and $c = 5.260$ Å. The twelve palladium atoms are situated in 8 (d) ($x = 0.1810$, $y = 0.0508$, $z = 0.3217$) and 4 (c) ($x = 0.0053$, $z = 0.9036$) positions, and the silicon atoms occupy a 4 (c) position ($x = 0.897_6$, $z = 0.469_9$.. Pd_3Si, thus, crystallizes in the cementite (DO_{11}) structure. The atomic arrangement in Pd_3Si is compared with those in isomorphous phases. (Author)

Watertown Arsenal Labs., Mass.
EFFECT OF COLD REDUCTION ON THE MECHANICAL PROPERTIES OF HEAT-TREATED Ti-6Al-4V ALLOY, by Eric B. Kula and Frank R. Larson. Apr 58, 23p. 4 refs. Technical rept. WAL TR 401/296; AD-157 805.
Order from LC mi$2.70, ph$4.80 PB 147 159

The effect on mechanical properties of cold reduction after solution treating and prior to aging was studied in a heat of Ti-6Al-4V alloy. Solution temperatures of 1700 and 1850°F for one-half hour were used, followed by four-hour aging treatments at 850 and 950°F. Cold reductions up to 41 percent for the 1700°F material and 62 percent for the 1850°F material were affected by swaging. The yield and ultimate tensile strengths are increased by deformation even after aging. In most cases, deformation also improves the tensile ductility although there may be a reduction in the impact strength. After solution treating at 1850°F, swaging 62 percent, and then aging, the ultimate tensile strength was 215,000 psi, the 0.1 percent yield strength 205,000 psi; and the reduction in area 28 to 37 percent. (Author)

Watertown Arsenal Labs., Mass.
THE RECRYSTALLIZATION TEMPERATURE OF IRON AS AFFECTED BY DILUTE TRANSITIONAL ELEMENTS, by E. P. Abrahamson, II and B. S. Blakeney, Jr. Jan 60, 15p. 3 refs. WAL TR 830. 3/1; AD-231 890
Order from LC mi$2.40, ph$3.30 PB 146 827

All of the transition elements raise the recrystallization temperature of iron. In the majority of the systems, the initial effect occurs at 0.10 atomic percent or less. All changes in rates of recrystallization temperature with added elements occur within the region of solid solubility. There is a correlation between the rate of change of recrystallization temperature with atomic percent second element and the electron configuration of the second element in the ground state. (a) Atoms with like outer electron shells behave similarly. (b) For atoms having a similar number of d-shell electrons, the fewer the s-shell electrons, the greater the effect. (c) The greater the number of filled inner electron shells, for a like outer configuration, the greater the change in properties. (Author)

Watertown Arsenal Labs., Mass.
ULTRASONIC DETERMINATION OF ELASTIC CONSTANTS AT ROOM AND LOW TEMPERATURES, by Norbert H. Fahey. Apr 60, 14p. 4 refs. Technical rept. no. WAL TR 118. 1/1.
Order from OTS $0.50 PB 161 514

Using ultrasonics, certain elastic properties of materials can be determined in a nondestructive test, which means that tests can be conducted on a finished product. With a machine which operates within the range of frequencies of 1-9 megacycles, bulk, shear and elastic moduli and Poisson's ratio can be determined. Tests were conducted at temperatures ranging from room to -452°F on steel, aluminum, molybdenum, magnesium, lead, Inconel, chromium, Monel, tantalum, columbium, brass, bronze, copper, carbon, plastic, and three titanium alloys. Some of the materials did not lend themselves to the test, due either to their microstructure or to the frequency range of the equipment. For the materials investigated, as the testing temperature decreased, the elastic and shear moduli increased, and Poisson's ratio decreased. Bulk modulus remained essentially constant. The effects of specimen size and shape, machining finishes, bonding agents, etc., are also discussed. (Author)

Westinghouse Research Labs., Pittsburgh, Pa.
OXIDATION OF TUNGSTEN AND TUNGSTEN BASED ALLOYS, by E. A. Gulbransen, K. F. Andrew and others. Rept. for 1 May 58-15 Aug 59 on Metallic Materials, Contract AF 33(616)5770. Feb 60, 86p. 48 refs. WADC Technical rept. 59-575.
Order from OTS $2.25 PB 161 718

This report describes work on a fundamental study of the oxidation of tungsten and its alloys. To understand the tungsten-oxygen system thermodynamic measurements were made on the oxides WO_3, $WO_{2.9}$ and

$WO_{2.72}$. The $W_3O_9(g)$ pressures over the solid oxide phases from WO_3 to WO_2 was measured and the homogeneity range of the several oxide phases determined. Kinetic studies were made on sheet and wire specimens from 500°C to 1300°C and for a broad pressure range. Crystal structure studies and photographic studies were made on the oxide scales. All the results suggest that the mechanism of oxidation is very complex. At 500°C and lower the reaction is probably diffusion controlled. Above 600°C localized edge type of reaction adds a complication. Above 1200°C the oxidation reaction is similiar to the combustion of graphite. The rate of oxidation is limited by the access of oxygen to the surface. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

Bartol Research Foundation, Franklin Inst., Swarthmore, Pa.
SEMI-ANNUAL REPORT OF THE WORK OF THE BARTOL RESEARCH FOUNDATION, by W. F. G. Swann. Rept. on Contract N6ori-144. 15 Mar 47, 78p. ATI-150 224.
Order from LC mi$4.50, ph$12.30 PB 146 952

Contents:
Cosmic ray investigations
Nuclear physics
Investigations of counters
Linear accelerator
(Report reproduces poorly)

Noyes Chemical Lab., U. of Illinois, Urbana.
ISOTOPE EFFECTS IN HIGH RESOLUTION NMR SPECTROSCOPY, by H. S. Gutowsky. Technical rept. no. 18 on Contract Nonr-1834(13). 6 May 59, 6p. 8 refs. AD-219 836.
Order from LC mi$1.80, ph$1.80 PB 146 449

Fluorine resonance in the CF_2D group of $\underline{n}$-C_3F_7D is shifted upfield by $0.60 \pm 0.05 \times 10^{-6}$ from that in the parent compound, n-C_3F_7H, while there is a smaller upfield proton shift for the CH_2D group in OCH_2D of $0.015 \pm 0.002 \times 10^{-6}$ with respect to CH_3 in OCH_3. Proton shifts of the same magnitude have been noted in several pairs of compounds. The main purpose of this note is to suggest that the differences in vibrational amplitudes of D and H atoms are the primary cause of such isotopic shifts.

Elementary Particles

[Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.]
ON THE REPRESENTATION OF THE SOLUTIONS OF THE RESTRICTED PROBLEM OF THREE BODIES BY POWER-SERIES, by Richard Schulz-Arenstorff. 30 Mar 59, 31p. 3 refs. Rept. no. DC-TR-1-59; AD-213 701.
Order from LC mi$3.00, ph$6.30 PB 145 966

The problem considered consists of the description of the solutions of the equations of motion for a particle with mass zero under the gravitational attraction of two positive masses, which revolve in plane circles around their center of gravity. This is nearly the situation for a lunar probe flight.

Cambridge U. (Gt. Brit.)
PHYSICAL LIMITATIONS TO DISPERSION RELATIONS, by John G. Taylor. Technical scientific note no. 3 on Contract AF 61(052)233. Jan 60, 27p. 20 refs. AFOSR-TN-60-276.
Order from LC mi$2.70, ph$4.80 PB 146 443

Limitations to the validity of dispersion relations arising in the general proof of these relations is discussed by considering fourth order perturbation theory. The exchange scattering of equal mass bosons or nucleons gives a limitation to the general proof, but closer analysis shows this limitation can be removed. The direct scattering term gives no limitation when anomalous thresholds are absent, but when they are present shows that the general proof cannot be applied to this case. A direct analysis in this latter case shows that the dispersion relations are not violated for any momentum transfer, though the two-dimensional representation is. (Author)

Institute of Theoretical Physics, Stanford U., Calif.
CONSTRUCTION OF COUPLED SCATTERING AND PRODUCTION AMPLITUDES SATISFYING ANALYTICITY AND UNITARITY, by J. D. Bjorken. Technical note no. 14 on Contract AF 49(638)388. Mar 60, 9p. 6 refs. AFOSR-TN-60-394.
Order from LC mi$1.80, ph$1.80 PB 146 875

A practical method has been found for computing coupled scattering and production processes within the framework of dispersion theory. (Author)

Johns Hopkins U., Baltimore, Md.
ANGULAR DISTRIBUTION OF K_L - MESON SECONDARIES, by E. B. Brucker and A. Pevsner, and others. Rept. on Contract AF 18(603)143. Jan 60, 10p. 1 ref. AFOSR-TN-60-94.
Order from LC mi$1.80, ph$1.80 PB 146 928

Johns Hopkins U., Baltimore, Md.
THE MASS OF THE Λ^o HYPERON, by Edward Byerly Brucker. Thesis. Rept. on Contract AF 19(603)143. Jan 60, 81p. 60 refs. AFOSR-TN-60-72.
Order from LC mi$4.80, ph$13.80 PB 146 927

The mass of the Λ^o -hyperon was determined in nuclear emulsion from the range and the relative orientation of the decay particles of twenty-five Λ^o decays. The new determination resulted in a Λ^o mass of 1115.55 ± 0.15 Mev, which corresponded to a Q-value of 37.71 ± 0.14 Mev. This new Q-value averaged with that of Barkas yielded a binding energy for $_{\Lambda}H^3$ of $+0.12 \pm 0.26$ Mev. The density and thicknesses of the pellicles of the emulsion stack were accurately determined using, respectively, Archimedes' principle and a dial indicator.

Washington U., St. Louis, Mo.
A MEASUREMENT OF THE LONGITUDINAL POLARIZATION OF Pr^{144} BETA-PARTICLES, by Werner Alfred Wilhelm Mehlhop. Doctoral thesis. Technical rept. no. 26 on Contract AF 18(603)108. 22 Feb 60, 112p. 46 refs. AFOSR-TN-59-1323.
Order from LC mi$6.00, ph$18.30 PB 147 144

A precision determination of the longitudinal polarization of the beta particles from radioactive Pr^{144} is reported. The polarization sensitive process utilized in this experiment is Møller-scattering, i.e. the scattering of free electrons by free electrons. A major feature of the apparatus is the detection of the two final state electrons (the original one and the one knocked out of the foil) in fast coincidence; this technique, necessary to distinguish the relatively scarce Møller-events from the hugh background of nuclear scatterings, at the same time discriminates against various undesired scatterings off chamber walls etc., all these scatterings being non-coincident. The thesis contains a thorough discussion of the two nuclei under investigation (Pr^{144} and the reference nucleus Y^{90}), especially from the point of view of small theoretical corrections potentially altering the simple $\frac{v}{c}$ - dependence of the polarization.

Instruments and Installations

Army Signal Research and Development Lab., Fort Monmouth, N. J.
IRRADIATION OF SEMIRAD AT THE GENERAL ATOMIC LINEAR ACCELERATOR (LINAC), 5 MAY 1959, by Stanley Kronenberg and Harry M. Murphy, Jr. 1 Sep 59, 17p. 2 refs. USASRDL Technical rept. 2070; AD-226 991.
Order from LC mi$2.40, ph$3.30 PB 146 787

Semirad instruments were irradiated with short bursts of gamma radiation at the linear electron accelerator (LINAC), General Dynamics Corp., San Diego, Calif. The purpose of the experiment was to determine Semirad response to radiation pulses of less than 10-μsec duration. Semirad instruments were exposed to the LINAC radiation source, and signals from the Semirad were transmitted to a triggered oscilloscope and the traces photographed. The Semirad response demonstrated that the time resolution was on the order of 10 mμsec or less. An interesting side effect was observed, viz., secondary-electron energies of >300v were noted. These high-energy secondary electrons are as yet unexplained. (Author)

Convair, Fort Worth, Tex.
CONVAIR REMOTE-AREA FAST-NEUTRON MONITOR, by A. H. Smith. Rept. on Contract AF [33](600)32054. 4 Aug 58, 30p. NARF 58-30T; MR-N-182; AD-201 127.
Order from LC mi$2.70, ph$4.80 PB 147 596

A multichannel system of remotely operated, fast neutron detectors for dose rate measurements to 20 rem/hr in the energy range from 0.1 to 10 Mev is described. The application of this system in health physics monitoring of neutron dose rates in reactor operation areas is discussed. A general description of the electronic system is followed by a detailed consideration of the system broken down into its functional units: a detector preamplifier, linear amplifier, pulse shaping network, digital-to-analog conversion network, differences amplifier and dose rate recorder. (Author)

Maryland U., College Park.
FINAL PROGRESS REPORT. Rept. for 24 Feb 50-31 Dec 58 on Contract NObsr-49066. [1958] 8p. AD-216 000.
Order from LC mi$1.80, ph$1.80 PB 147 369

The two general phases of work on halogen counters are reported: exploration and application. An outline of the accomplishments of the first phase is included. The second phase has been devoted to the construction of geiger counters and is summarized under the following categories: U. S. Patent Application no. 666, 831; all glass vacuum gauge; the use of chlorine 36 to study the action of chlorine gas in contact with various metal and glass surfaces; and the construction of some counters from the standpoint of obtaining a high degree of stability.

Naval Radiological Defense Lab., San Francisco, Calif.
AN ALPHA SURVEY RADIAC FOR FIELD USE, by K. Sinclair and G. Kiyoi. 14 May 59, 32p. 9 refs. Research and development technical rept. USNRDL-TR-326; AD-218 286.
Order from LC mi$3.00, ph$6.30 PB 147 376

An alpha survey radiac employing a photomultiplier tube and scintillation detector was developed. The instrument utilizes transistor circuitry and operates from 2 standard flashlight batteries. Four linear ranges are provided with full scale indication on the highest range corresponding to 10,000 $\mu g/m^2 Pu^{239}$. The instrument was designed with a separable probe and a telescoping extension for easier ground monitoring. A thorium metal source is attached to the instrument housing for checking instrument calibration in the field. The device conforms satisfactorily to the military requirements for altitude, humidity, vibration, shock, and storage. The operational battery life is in excess of 40 hours. Instrument error at low temperatures slightly exceeds the ±20% accuracy requirement; however, adequate measurements are readily made by using the thorium check source to provide a check point. Instrument response to low energy X-rays is excessive. However, tests indicate that a simple lead filter will eliminate this difficulty. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
A FLAME PHOTOMETRIC APPARATUS FOR THE DETERMINATION OF RADIOACTIVE MATERIALS, by M. Honma. 24 Apr 56, 11p. 6 refs. Research and Development technical rept. USNRDL-TR-83; AD-99 256.
Order from LC mi$2.40, ph$3.30 PB 147 015

Quantitative determinations with the flame photometer are generally carried out without regard to the com-

bustion products. The gases and particulate matter evolved from the combustion are usually allowed to diffuse into the room. At best, if the oxidation products are thought to be harmful the flame photometer is operated in an efficient hood. However, when radioactive solutions have to be analyzed by the flame photometer they cannot be run under ordinary circumstances. Since health hazards and spatial contamination are prime considerations when running these solutions, provisions must be made so that the radioactive particles can be contained and controlled. A triple-filter apparatus has been devised to be used with the flame photometer in which the radioactive particles are filtered out before the exhaust gases are discharged. The operational techniques for the apparatus are discussed. A table showing the contamination of the various parts of the apparatus after an 80-hr run is presented. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
A LOW RANGE BETA-GAMMA SURVEY METER, by M. H. Eklund and G. A. Work. 3 Feb 58, 54p. 5 refs. Research and Development technical rept. USNRDL-TR-255; AD-205 624.
Order from LC mi$3.60, ph$9.30 PB 147 377

A low range beta-gamma survey meter employing halogen-quenched G-M tubes and transistor circuitry has been developed. The instrument measures gamma radiation from 0 - 500 mr/hr in four linear ranges and provides beta indication on all ranges. The instrument has been conservatively designed to meet military specifications. A transistor oscillator converts battery voltage to regulated high and low voltages, giving more than 400 hours of operation with two easily obtainable flashlight cells. The use of a corona regulator has been avoided. The rate-meter is an advanced zero-stable diode pump circuit requiring no pulse-width range switching. The survey meter has been packaged in a form providing easy handling with one-hand operation for some monitoring applications. The instrument is also alpha sensitive, reading an equivalent 2 mr/hr in contact with a plutonium source of 5.10^{-3} micro-curies/cm^2. (Author)

Radiation Effects Information Center, Battelle Memorial Inst., Columbus, Ohio.
A SURVEY OF CURRENT RESEARCH AND DEVELOPMENTS IN THE FIELD OF DOSIMETRY (FIRST ADDENDUM) by Mary J. Oestmann and J. F. Kircher. Rept. on Contract AF 33(616)5171. 31 Mar 59, 21p. 40 refs. REIC rept. no. 6 (Addendum); AD-210 766.
Order from LC mi$2.70, ph$4.80 PB 147 104

This is the first addendum to the REIC Report No. 6 "A Survey of Current Research and Developments in the Field of Dosimetry" Very few new dosimeter concepts have been reported during the past year. Advances made during 1958 consist primarily of refinements of the previously established dosimeter systems. Investigations have involved reaction mechanisms and the determination of more accurate G-values. An appropriate choice of materials has helped to extend the useful range of some dosimeters. Standard foils and methods of measurement of these foils are being developed for neutron dosimetry. Further details on any one system may be found from the extensive bibliography provided. (Author) (See also PB 151 571)

Nuclear Engineering and Power

Army Chemical Warfare Labs., Army Chemical Center, Md.
THE FEASIBILITY OF REDUCING THE COST OF DISPOSAL OF REACTOR WASTES BY USING FISSION PRODUCTS AS HEAT SOURCES, by Luther M. Hardin and Robert P. Beckelheimer. Nov 59, 50p. 26 refs. CWLR 2307; AD-229 969.
Order from LC mi$3.30, ph$7.80 PB 146 757

Predictions and calculations are presented for (1) the rate of growth of the nuclear-power industry, (2) the total fission-product power per unit reactor power (3) the useful fission-product heat output per unit reactor power, (4) the useful heat output from all the fission products resulting from the nuclear power industry during the period 1960 to 1980. Costs involved in the production of heat are compared with the value of the heat produced. (Author)

Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
SOME NEW TYPES OF NEUTRON-SHIELDING MATERIALS, by Anthony N. Fasano. Research conducted at Brookhaven National Labs. June 59, 7p. WADC Technical note 59-227.
Order from OTS $0.50 PB 161 308

Materials having high neutron-absorption cross sections are needed for protecting gamma and neutron detectors from thermal-neutron damage and to form collimators for beams of neutrons. Boron or lithium, as the powdery compounds B_4C and LiF, could absorb the neutrons, but as powders are impossible to apply or form into protective shields. Processes were developed using inexpensive plastic, paraffin, and linseed oil as bonds and G. E. thinner, Saurizen thinner, trichlorethylene, and turpentine as solvents to produce materials that can be molded, formed, cast, rolled, or painted as a protective shielding or coating. Methods were devised for reclaiming the expensive boron and lithium compounds. (Author)

Nuclear Reactions

Naval Research Lab., Washington, D. C.
A STUDY OF PHOTONS IN SODIUM IODIDE SCINTILLATION CRYSTALS, by Charlotte M. Davisson and L. A. Beach. Final rept. 31 Dec 59, 75p. 23 refs. NRL rept. 5408.
Order from LC mi$4.50, ph$12.30 PB 146 030

Using Monte Carlo methods coded for computation by the Narec digital computer, a study has been made of the interactions within NaI(Tl) crystals of photons incident along the center axis of cylindrical crystals. Incident energies studied were 0.3, 0.5, 0.7, 1.0, 1.2, and 1.5 Mev, and crystal sizes ranged from 1 in. diameter by 1 in. long to 5 in. diameter by 8 in. long. Pair production was included only as an absorption,

and the results were not modified by any response function of counting and recording instruments. The results are presented in a way that shows the variation with incident energy, with crystal diameter, and with crystal length of the following: (a) histogram distributions of the energy given to the crystal by the photons, (b) photoefficiencies, (c) photofractions, (d) number of collisions within the crystals, and (e) the geometrical distribution of the emerging, scattered photons. Constants for an empirical equation for photofractions as a function of incident energy dimensions were obtained from the results and can be used to estimate photofractions for any incident energy and crystal size in the ranges studied. (Author)

Sarah Mellon Scaife Radiation Lab., U. of Pittsburgh, Pa.
STUDY OF SOME REACTIONS OF 15 MEV DEUTERONS WITH THE LITHIUM ISOTOPES, by Ernst Wolfgang Hamburger. Doctoral thesis. Technical rept. no. 12 on Precision Scattering of Nuclear Particles, Contract N7onr-32505. Apr 59, 132p. 47 refs.
Order from LC mi$6.90, ph$21.30 PB 146 035

Metallic targets of enriched Li^6 and Li^7 were bombarded with 15 Mev deuterons. The results of the (d, p),(d,t) and (d,He^3) reactions were compared with stripping theory and with the predictions of the shell model. The agreement is, in general, satisfactory.

Radioactivity

Army Chemical Warfare Labs., Army Chemical Center, Md.
A PORTABLE REMOTELY OPERATED DEVICE FOR PRODUCING A GAMMA RADIATION FIELD, by Ralph E. Rexroad and Murray A. Schmoke. Dec 59, 21p. 2 refs. CWL Special Pub. 3-8; AD-231 042.
Order from LC mi$2.70, ph$4.80 PB 146 857

A portable field device is described for lifting a high-intensity gamma radiation source from its shield without exposing the personnel involved to harmful radiation. The device raises the radioactive source from its steel-jacketed lead shield by air pressure. High-level radiation fields can be produced with this system with very little exposure of test personnel to radiation.

Institute of Engineering Research, U. of California, Berkeley.
ON THE SMALL-SCALE NON-HOMOGENEITY OF FALLOUT DEPOSITION, by G. M. Corcos. Rept. on Contract CD-SR-58-40. 30 Oct 58, 54p. 11 refs. Series no. 2, issue no. 2; OCDM-UCAL-2-2-58.
Order from LC mi$3.60, ph$9.40 PB 147 391

The main contributions of the present report are to provide a guide to the testing of fallout deposition and to adduce evidence that inhomogeneous depositions should be expected, mostly through the larger particles.

Naval Radiological Defense Lab., San Francisco, Calif.
ANALYSIS OF RADIOLOGICAL DECONTAMINATION DATA OBTAINED FROM FIELD TESTS, by C. F. Miller. 3 Apr 59, 86p. 7 refs. Research and development technical rept. USNRDL-TR-321; AD-219 720.
Order from LC mi$4.80, ph$13.80 PB 147 379

Reclamation data from Operation Plumbbob are used to illustrate a method of treating and analyzing such data obtained in field-test experiments. The method utilizes available radiation-scattering computations to estimate the contribution of radiation sources outside reclaimed areas to the radiation field inside the areas. These contributions are then subtracted to determine a more accurate value of the true effectiveness of the reclamation procedure of procedures. (Author)

Naval Radiological Defense Lab., San Francisco, Calif.
GAMMA DECAY OF FISSION PRODUCTS FROM THE SLOW-NEUTRON FISSION OF U^{235}, by Carl F. Miller. 11 July 57, 106p. Research and Development technical rept. USNRDL-TR-187; AD-147 420.
Order from LC mi$5.70, ph$16.80 PB 147 393

Photon energy radiation rates and photon emission rates from the fission products produced by slow-neutron bombardment of U^{235} are computed, using nuclear decay scheme data and the results of new computations for the gross activity in terms of disintegration rate. The computed rates were used to determine, as a function of time after fission, the mean photon energy per disintegration, and the number of beta rays per photon. Curves showing photon energy radiation rates, photon emission rates, and beta rates for a time range of about 46 minutes to about 300 years after fission are presented. A comparison is made of activity and the computed photon energy radiation rates for 1 hr to 3 years after fission. The computed decay curves for 10^4 fissions from slow-neutron fission of U^{235} using the USNRDL 4-pi Ionization Chamber is presented. (Author)

Naval Radiological Defense Lab., San Francisco, California.
PHYSICAL, CHEMICAL, AND RADIOLOGICAL PROPERTIES OF SLURRY PARTICULATE FALLOUT COLLECTED DURING OPERATION REDWING, by N. H. Farlow and W. R. Schell. 5 May 57, 17p. 7 refs. Research and Development Technical rept. USNRDL-TR-170; AD-145 733.
Order from LC mi$2.40, ph$3.30 PB 147 381

The properties of individual fallout particles produced by nuclear detonations at zero height over shallow sea water are analytically described for the first time. The particles produced during Operation REDWING were slurry masses composed of water, dissolved and crystalline sea salts, and seawater-insoluble solids from the weapon, barge, and ocean floor. Special techniques were used to measure the chloride, water, and insoluble-solids content of individual slurry particles. Autoradiography showed that the activity is primarily associated with the solids. A table of

experimental data presents particle size versus time of arrival after detonation as well as measurements of particle density and relative specific activity. Estimates of mass and relative activity of fallout per unit area for certain locations about the shot point are shown. (Author)

Naval Research Lab., Washington, D. C.
A STANDARD SOURCE OF RADIATION FOR RADIAC DETECTORS. PART II. EXTENSION OF THE RANGE OF EXPOSURE-DOSE RATES AND THE NEW Cs-137 SOURCE, by A. E. Nash and W. E. Kunz. 22 Apr 60, 14p. 8 refs. NRL rept. 5462.
Order from LC mi$2.40, ph$3.30 PB 145 058

Four facilities of similar design to produce standard gamma-ray fields have been constructed and calibrated for use with cobalt-60 and cesium-137 sources. These facilities provide four intensity ranges, two of which, the low and the medium ranges (the medium range was formerly called the high range), have previously been described and calibrated. The low range covers the region between background and 0.5 r/hr using interchangeable sources of Co-60, Cs-137, and Ra. The medium range, using Co-60, extends the field to 50 r/hr. The two new higher ranges extend the exposure-dose rate for the Co-60 source (150 curies) in one case and introduce a new source of Cs-137 (100 curies) in the other. The range of calibrated gamma-ray intensity now includes the region from background to over 2000 r/hr for Co-60 and to 800 r/hr for Cs-137. In addition to the calibration of the two new facilities, the older medium range has been recalibrated using a carbon ionization chamber, for which a calibration procedure has been adapted from a standard procedure. The two new sources are being used in conjunction with the new 300-kev x-ray facility to provide energy calibration points for energy-dependence measurements. (Author)

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

Aeronautical Research Lab., Wright Air Development Div., Wright-Patterson AFB. Ohio.
MAGNETIC SHOES FOR HUMAN ORIENTATION IN SPACE, by J. F. Nicholson and D. W. Naas. Rept. on Solid State Research and Properties of Matter. Feb 60, 12p. 6 refs. WADC TN-59-352.
Order from OTS $0.50 PB 161 727

This report describes both permanent and electromagnetic shoes for human orientation in a weightless environment. The electromagnetic shoes operate on a low voltage power source which may be adjusted to the individual requirements of the wearer. A microswitch which interrupts the magnetic circuit each time the heel is raised reduces walking fatigue and increases the operational life of the batteries. An inertia switch is included in the magnetic circuit as a safety device. When the switch senses any sudden acceleration or deceleration, it shunts the potentiometer and allows additional current to flow to the electromagnet thereby increasing the holding force. (Author)

Maritime Administration, Washington, D. C.
OFFICER AND CREW STANDARD FURNITURE. Drawings prepared by Raymond Loewy Associates on Contract MA-1755. June 60, 49p.
Order from OTS $1.50 PB 161 768

Quartermaster Research and Engineering Center, Natick, Mass.
PONCHO, LIGHTWEIGHT, OD, W/HOOD (PROTECTIVE), FINAL DEVELOPMENT AND ENGINEERING TEST OF, by S. J. Shurtleff. July 58, 26p. 10 refs. Technical rept. CP-8.
Order from LC mi$2.70, ph$4.80 PB 138 275

Military characteristics for protective clothing and equipment require that the items be non-flammable, protective against thermal and CBR agents, and that present standard items of field clothing be considered in meeting these objectives. The protective poncho described represents progress made by the Quartermaster Corps to meet these combined requirements. The protective poncho is made in the same design as the standard vinyl-coated poncho, but is fabricated of a neoprene-coated Fortisan fabric.

Tropical Deterioration Administrative Committee, Office of Scientific Research and Development.
TROPICAL DETERIORATION OF EQUIPMENT AND MATERIALS. Summary technical rept. vol. 1, Contract OEMsr-1131. 1946, 100p. 89 refs.
Order from LC mi$5.40, ph$15.30 PB 139 781

Contents:
Organisms associated with tropical deterioration
Prevention of deterioration of optical instruments
Tropical deterioration of textiles
The problem of fungal growth on synthetic resins, plastics, and plasticizers
Tropical deterioration of photographic equipment and supplies
Tropical deterioration of electric and electronic equipment
Coordination of test methods
Results of testing materials under tropical conditions
Recommendations for future work

PHYSICS

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
TRANSISTOR PHYSICS AND ELECTRONICS, LECTURES GIVEN SEPT. 1952-JUNE 1953, by W. H. Duerig, J. F. Jenkins, Jr. and others. Rept. on Contract NOrd-7386. Oct 53, 431p. 69 refs. TG-220.
Order from LC mi$11.10, ph$66.60 PB 147 283

This set of lecture notes was prepared to introduce electronics engineers to the subject of transistors and their application techniques.

California U., Berkeley.
THE THRESHOLD CRITERIA FOR ELECTRICAL BREAKDOWN AND SPARK BREAKDOWN IN GASES, by Leonard B. Loeb. Rept. on Contract Nonr-222(44). [1958] 23p. 48 refs.
Order from LC mi$2.70, ph$4.80 PB 137 959

Columbia U., New York.
POINCARÉ AND THE SHORTCOMINGS OF THE HAMILTON-JACOBI METHOD FOR CLASSICAL OR QUANTIZED MECHANICS, by L. Brillouin. Quarterly rept. no. 5 on Contract Nonr-266(56). 31 July 59, 23p. 7 refs. AD-219 928.
Order from LC mi$2.70, ph$4.80 PB 147 069

Institute of Mathematical Sciences, New York U., N. Y
DIFFRACTION BY AN ELLIPTIC CONE, by Lester Kraus and Leo M. Levine. Rept. on Contract AF 19(604)5238. Mar 60, 32p. 11 refs. Research rept. no. EM-156; AFCRC-TN-60-195.
Order from LC mi$3.00, ph$6.30 PB 147 527

The boundary value problems corresponding to a spherical wave incident on an acoustically soft or hard elliptic cone, or plane angular sector, are solved. The method of separation of variables in a sphero-conal coordinate system is used. The special functions which arise are simply periodic and nonperiodic solutions of the Lame differential equation. (Author)

Stanford Research Inst., Menlo Park, Calif.
RESEARCH ON EFFECTS OF NUCLEAR RADIATION ON MAGNETIC AND DIELECTRIC MATERIALS: INSTRUMENTATION, by S. I. Taimuty, C. A. Rosen and others. Scientific rept. no. 3 on Contract AF 19(604)4141. 10 Nov 59, 23p. 8 refs. AFCRC-TN-59-990; AD-232 109.
Order from LC mi$2.40, ph$7.80 PB 145 970

As the first part of a project to study the effect of nuclear radiation on magnetic and dielectric materials, three instruments have been developed to measure radiation-induced changes in the properties of magnetic and ferroelectric materials. One is a magnetic hysteresigraph for recording hysteresis loops in toroidal magnetic samples at frequencies of 400 cps to 100 kcps. The second is an apparatus employing a bridge technique for small-signal magnetic permeability measurements at frequencies of 15-640 kcps. The third is a ferroelectric hysteresigraph for recording hysteresis loops in ferroelectric materials at frequencies of 60-10,000 cps. (Author) (See also PB 161 115)

Acoustics

General Applied Science Labs., Inc., Westbury, N. Y.
THE NOISE FIELD OF A SUBSONIC JET, by Gino Moretti and Simon Slutsky. Rept. on Contract AF 49(638)194. Nov 59 169p. 8 refs. GASL Technical rept. no. 150; AFOSR-TN-59-1310.
Order from LC mi$7.80, ph$25.80 PB 147 321

The acoustic far field of a singularity is investigated under several different conditions of the medium. The simple cases of a source in an infinite wind, as observed at a fixed or a moving point, are analyzed to permit comparison with physical systems of practical interest, e.g., jet engine fly-by noise analysis. Widespread misunderstanding of the Lighthill Mach number dependence has been noted and clarified by means of the above analysis. The far field of a singularity imbedded in a jet has been determined as a function of jet velocity and temperature distribution with special emphasis on the case of uniform distribution in the jet. Comparison of experimental results is made and fair agreement noted. Factors involved in failure to obtain complete agreement are discussed. (Author)

[Max-Planck Institut für Strömungsforschung (Germany)].
EXPERIMENTS RELATING TO THE INTERACTION OF SOUND AND TURBULENCE, by Dieter W. Schmidt. Rept. for 1 Dec 58-30 Nov 59 on Contract AF 61(514)1143. [1960] 20p. 6 refs. AFOSR-TN-60-347.
Order from LC mi$2.40, ph$3.30 PB 147 110

The paper gives some new experimental results about the scattering of sound by a turbulent flow. The dependence of the scattering on the frequency of sound and on the direction of the scattering vortices was investigated. In both cases good agreement was obtained between the measurements and theoretical predictions. Additionally, some equipment is described which facilitates the use of hot-wires for the measuring of turbulence. Especially, design characteristics of an apparatus are given, by which hot-wire probes can be rewired precisely and quickly. (Author)

Naval Ordnance Test Station, China Lake, Calif.
THE DISPLACEMENT TRANSDUCER: A DEVICE FOR MEASURING LINEAR DISPLACEMENT, by D. E. Melton. 7 Nov 58, 25p. 2 refs. NOTS TP-2139; NAVORD rept. 6433; AD-214 236.
Order from LC mi$2.70, ph$4.80 PB 146 978

A linear-displacement measuring device was designed and tested. The device, known as the Displacement Transducer, has been used to determine the inward diametrical deflection of the walls in cylindrical pressure vessels when such vessels are subjected to external hydrostatic pressure. (Author)

Navy Electronics Lab., San Diego, Calif.
INTERLEAVED-PLATE ELECTRODYNAMIC TRANSDUCER. PART I. STATIC THRUST ANALYSIS, by Burwell Goode. 11 Dec 58, 11p. 1 ref. Research and Development rept. 883; AD-214 347.
Order from LC mi$2.40, ph$3.30 PB 146 977

An electrodynamic transducer has been designed to serve as a broadband low-frequency underwater sound source, putting a reasonable amount of power into the water for the range 20 to 2000 cps. It is a camera-size, twin-piston transducer, with parallel plates of copper or aluminum windings, separated by silicon iron strips, serving as driving components. A thrust

formula was derived and compared with the experimental values of a pilot model. The vibrator can deliver 200 pounds of rms thrust for pulse operation. (Author)

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
THE EVALUATION OF SURFACE REVERBERATION IN SONAR, by J. Warren Horton. 4 Mar 59, 19p. 22 refs. USL Research rept. no. 422; AD-217 108.
Order from LC mi$2.40, ph$3.30 PB 147 378

A significant factor affecting the magnitude of the acoustic energy returned to a source point in the ocean as a result of back-scattering from the ocean surface is the coefficient by which to multiply the incident intensity at a scattering point to obtain the surface area derivative of the intensity of the scattered energy, as measured at unit distance from this point. This scattering coefficient is a function of the angle between the path by which energy reaches and leaves the scattering surface and this surface. To compute the apparent plane wave intensity of the energy returned to the source point, at any instant, it is necessary to evaluate the derivative of the free-field intensity of this energy with respect to area of scattering surface. This derivative is a function of (1) the scattering coefficient, (2) the propagation factor applying to the path between source point and scattering point, (3) the relative transmitting and receiving responses of the transducer applying to this path, and (4) the index intensity of the transmitted energy pulse. The value of the integrand appearing in the expression for the intensity of the received energy may be measured, as a function of time, by observing the rate of change of this energy with change in pulse length. Since all factors in this integrand except the scattering coefficient may be evaluated, this coefficient may be determined. This method is theoretically ideal and operationally practical. (Author)

Navy Underwater Sound Lab., Fort Trumbull, New London, Conn.
MUTUAL RADIATION IMPEDANCE BETWEEN PISTONS ON SPHERES AND CYLINDERS, by Carles H. Sherman. 24 Nov 58, 32p. 24 refs. USL Research rept. no. 405; AD-207 686.
Order from LC mi$3.00, ph$6.30 PB 147 382

Determination of the mutual radiation impedance coefficient is shown to be the essential part of the acoustic radiation problem for an array of interaction pistons. Expressions for this coefficient are derived in the cases of circular and rectangular pistons on a rigid sphere and rectangular pistons on an infinite, rigid cylinder. Numerical data showing the real and imaginary parts of this coefficient as a function of the separation between circular pistons on a sphere are presented for several values of ka. (Author)

Electricity and Magnetism

Indiana Steel Products Co., Valparaiso.
THE REMANENCE OF ALNICO V AND VI MAGNETS BETWEEN ROOM TEMPERATURE AND 550°C, by Rudolf K. Tenzer. Rept. for Nov 55-Aug 59 on Magnetic Materials, Contract AF 33(616)3385. Jan 60, 21p. 2 refs. WADC Technical rept. 59-438.
Order from OTS $0.75 PB 161 708

Because Alnico V and VI magnets have been found suited for use at temperatures up to 550°C, the behavior of remanence in such magnets was studied closely at elevated temperatures. Temperature effects on the remanence of a magnet are clearly classified and defined: (a) reversible (b) irreversible and (c) effects due to changes in the material. These effects were determined on Alnico V and VI magnets at temperatures up to 570°C for periods as long as 1000 hours. Material effects of a few percent can be minimized for magnet applications between 350°C and 550°C by heat treating at the highest operating temperature for at least 24 hours. Irreversible effects can be eliminated by cycling the magnets between room temperature and the highest operating temperature. After stabilization, remanence varies less than ±1% at elevated temperatures during exposures up to 1000 hours. Reversible effects vary according to the type of material and the temperature range in which a magnet is stabilized. (Author)

National Bureau of Standards, Boulder, Colo.
DYNAMIC MEASUREMENTS OF THE MAGNETO-ELASTIC PROPERTIES OF FERRITES, by Virgil E. Bottom. [1957] 54p. 12 refs. Technical note no. 49.
Order from OTS $1.00 PB 151 408

The relations between the mechanical and magnetic properties of a ferrite are derived for the small signal or reversible condition using thermodynamic principles. The equation of motion of a ferrite ring driven in its fundamental mode is set up and solved leading to the equivalent electrical circuit of the magnetostriction resonator. From mechanical measurements of the density and dimensions of the ring and electrical and frequency measurements of the resonator, the elastic modulus, permeability, magnetostriction coefficients and loss factors in the ferrite can be determined. Apparatus is proposed for performing the above measurements. (Author)

Electronics

Army Signal Research and Development Lab., Fort Monmouth, N. J.
PROCEEDINGS OF THE ANNUAL SYMPOSIUM ON FREQUENCY CONTROL NO. 13, 12-14 MAY 1959, ASBURY PARK, N. J. 21 Aug 59, 739p. 107 refs.
Order from LC mi$11.10, ph$111.90 PB 146 982

See also PB 142 945

Canterbury U. (New Zealand).
SOUTHERN HEMISPHERE METEOR RADIANTS AND RATES. PART (a) METEOR RATES WITH CONSTANT PARAMETERS, by C. Ellyett, C. S. L. Keay and others. Scientific rept. no. 1 on Contract AF 64(500)6. 27 Oct 59, 20p. 5 refs. AFCRC-TN-59-964; AD-232 112.
Order from LC mi$2.40, ph$3.30 PB 146 131

An experiment is conducted to obtain continuous observation of all-sky radar-meteor rates over a year. This study involved a critical appraisal of all the experimental factors which can introduce spurious rate variations. Apparatus is described. Both artificial and galactic noise cause errors. A special design of receiver, using two IF channels, largely overcomes the artificial noise. The galactic noise can be overcome by a self-compensating video stage. A riometer was built to study radio noise of auroral origin, and to provide complementary data to the meteor receiver in assessing the effect of noise variation on meteor rate counts. (Author)

Case Inst. of Tech., Cleveland, Ohio.
STUDY OF CONTROL OF APERTURE FIELDS. Scientific rept. no. 10 for 1 June-30 Nov 59 on Contract AF 19(604)3887. [1959] 55p. 19 refs. AFCRC-TN-60-155.
Order from LC mi$3.60, ph$9.30 PB 146 918

Anisotropic properties of artificial dielectrics: shunt susceptance of planar array of circular discs, evaluation of interaction fields, and variational formulation for shunt susceptance; Diffraction of a plane wave by a reflector; Solid angle reflector synthesis; and measurement of surface currents. (See also PB 139 897)

Electronics Research Lab., Stanford U., Calif.
THE MECHANISM OF RADIO REFLECTIONS FROM METEORIC IONIZATION, by Von R. Eshleman. Technical rept. no. 49 on Contract N6onr-251, T.O. 7. 15 July 52, 137p. 46 refs. ATI-163 933.
Order from LC mi$6.90, ph$21.30 PB 146 479

The development of a theory of radio reflections from cylinders of ionization is undertaken in order to explain the characteristics of radio echoes from meteor trails. It is found that the field strength of a radio wave reflected from an ionization column is dependent upon the polarization of the incident wave with respect to the cylinder axis, the size of the column, the total number of electrons per unit of length along the column, and the radial variation of electron volume density. Two theoretical approaches to the problem are investigated. One approach is obtained by solving the electromagnetic wave equation for dielectric columns with cylindrical symmetry, while the other method consists of summing the fields scattered by the individual electrons in the column.

Lincoln Lab., Mass. Inst. of Tech., Cambridge.
THE CONDUCTANCE OF A SLOT IN AN ARRAY ANTENNA, by S. J. Rabinowitz. Rept. on Contract AF 19(122)458. 31 Dec 58, 23p. 16 refs. Technical rept. no. 192; AD-209 908.
Order from LC mi$2.70, ph$4.80 PB 146 210

The driving point impedance of an element in an array antenna is different from its value when it is isolated in free space. This difference is due to the mutual coupling between elements of the array. The conductance of a slot element in a planar array or in a linear array is found. The calculations are based on well-known antenna gain and pattern relations. Complete agreement between these values and those found by different methods results. (Author)

Naval Research Lab., Washington, D. C.
COMPARISON OF MICROWAVE AND LANGMUIR PROBE TECHNIQUES FOR THE INVESTIGATION OF ELECTRICAL DISCHARGES, by R. C. Jones, C. M. Howe, and J. L. Ahearn. Interim rept. 21 Apr 60, 20p. 11 refs. NRL rept. 5468.
Order from LC mi$2.40, ph$3.30 PB 145 350

Properties of rocket motor exhausts have been studied at NRL by propagating focused microwave energy through them. In this study, the exhaust was replaced by an electrodeless discharge. The attenuation was measured and then compared with that predicted on the basis of a given electron density and collision frequency. These parameters were arrived at by probe measurements. Agreement between the two methods fell within the range of accuracy of measurement. (Author)

Oxford U. (Gt. Brit.)
HARMONICS FROM A MICROWAVE GAS DISCHARGE, by N. R. Bierrum and D. Walsh. Technical note no. 5 on Contract AF 61(514)1183. [1959] 11p. 5 refs. AFOSR-TN-60-280.
Order from LC mi$2.40, ph$3.30 PB 146 441

Harmonic power from a 10 cm. wavelength glow discharge in neon has been detected down to 6 mm wavelength (18th harmonic). The fundamental power is fed from the waveguide to a coaxial line terminated by the discharge tube. A second smaller waveguide is coupled to the coaxial line to extract the harmonic power. With careful matching at each wavelength, the conversion loss appears to fall off by only 3-4 db per harmonic after an initial drop of 35 db to the third harmonic (lowest harmonic measured). A typical conversion loss from 10 cm. to 8 mm (12th harmonic) is 63 db, e. g. 20 kW input, 10 mW output. In general the output power increases with input power until arcing in the mount spoils the measurement. A pressure range of 5-39 mm. Hg. has been used. (Author)

Rome Air Development Center, Griffiss AFB, N. Y.
ANTENNA HEIGHTS AND INTERFERENCE REDUCTION , by Benjamin Lindeman. Apr 60, 28p. 4 refs. RADC-TN-60-45.
Order from LC mi$2.70, ph$4.80 PB 146 922

The use of receiving antenna height adjustment to minimize interference effects is explored in detail. A working set of formulas and nomograms is provided to assist design and installation personnel in establishing antenna heights, in order to increase compatibility of equipments that are in close proximity. (Author)

Syracuse U. Research Inst., N. Y.
A STUDY OF POSTS IN CIRCULAR WAVEGUIDE, by Alfred T. Villeneuve. Final rept. for 1 Feb 56-30 May 57 on Contract AF 30(602)1507. 20 June 57, 77p. 14 refs. SURI rept. no. EE400-575F; RADC-TR-57 145; AD-131 241.
Order from LC mi$4.50, ph$12.30 PB 146 127

This report describes a study for the determination of the equivalent circuit parameters of a thin conducting post spanning the cross section of circular waveguide and the application of such posts to the polarization twist duplexer. A variational approach is applied to the equivalent circuit problem and the general problem of the equivalent circuit of obstacles in guides is discussed. No numerical results have been obtained for the equivalent circuit parameters. The problem of application of posts to the polarization twist duplexer was investigated through the use of matrix methods, but no conclusions could be drawn from such a formulation without extensive cut and try calculations.

Willow Run Labs., U. of Michigan, Ann Arbor.
FOUNDATIONS OF CIRCUIT ANALYSIS, by William M. Brown. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. Sep 59, 21p. 6 refs. 2900-92-R; AD-226 336.
Order from LC mi$2.70, ph$4.80 PB 146 828

A unified picture is given of operational circuit analysis through a study of its foundations. Several specific considerations are discussed as extensions of the basic theory. A feature of the development that the memorandum provides is that the existence and uniqueness of a transfer function and some of its properties are established without reference to differential equations or other detailed aspects of circuits. The role of exponentials is first studied in detail, and it is proved that exponentials and only exponentials are eigen functions for all linear, time-invariant circuits. The following three circuit properties are then considered: (1) the output at any one complex frequency depends only upon the component of the input at that frequency; (2) the circuit is linear; or (3) the circuit is time-invariant. It is shown that any two of these properties imply the other one, but that no one implies any other. A general transform which includes sinusoidal analysis, Fourier, Laplace and Stieltjes transforms as special cases is defined and discussed briefly. The topics of nonreal circuits and realizable circuits are discussed briefly. (Author)

Molecular Physics and Spectroscopy

Hebrew U. (Israel).
PARAMAGNETIC AND OPTICAL SPECTRA OF YITTERBIUM IN THE CUBIC FIELD OF CALCIUM FLUORIDE, by W. Low. Technical note no. 11 on Contract AF 61(052)59. Jan 60, 8p. 7 refs. AFOSR-TN-60-308.
Order from LC mi$1.80, ph$1.80 PB 147 109

The paramagnetic resonance spectrum of Yb^{3+} in CaF_2 was observed at 20°K and 3 cms wavelength. The spectrum is described by a cubic spin Hamiltonian $\mathcal{H} = g\beta H.S. + A\,S\cdot I$ with $g = 3.426 \pm 0.001$, $S = 1/2$, $A^{171} = 886.5 \pm 1.5 \times 10^{-4}$ cm^{-1}, $A^{173} = 243.2 \pm 0.4 \times 10^{-4}$ cm^{-1}, $I^{171} = 1/2$, $I^{173} = 5/2$. The ratio of magnetic moments is $\frac{\mu^{173}}{171} = 1.374_9 \pm 0.005$. The optical spectrum shows lines of 9774, 9770, 9763 A° and more diffuse and unresolved bands at 9080 and 12730 A°. The paramagnetic spectrum is explained as arising from the Γ_7 doublet. The other levels are removed by at least a few cm^{-1} leading to an isotropic g value of 3Λ or $\frac{24}{7}$ for the lowest Γ_7 level. (Author)

Hebrew U. (Israel).
PARAMAGNETIC RESONANCE SPECTRUM OF MANGANESE IN CORUNDUM, by W. Low and J. T. Suss. Technical note no. 12 on Contract AF 61(052)59. Feb 60, 7p. 12 refs. AFOSR-TN-60-423.
Order from LC mi$1.80, ph$1.80 PB 147 108

The paramagnetic resonance spectrum of Mn^{2+} in Al_2O_3 was measured at 3 cms. The spectrum can be expressed in a spin Hamiltonian with trigonal symmetry with the following parameters: $g_{\parallel} = 2.0017 \pm 0.001$, $g_{\perp} = 2.000 \pm 0.002$, $D = +194.2 \pm 1$, $a\text{-}F = +21.9 \pm 0.6$, $A = -79.6 \pm 0.5$, $B = -78.8 \pm 0.8$ in units of 10^{-4} cm^{-1}. (Author)

King's Coll., U. of London (Gt. Brit.)
MOLECULAR SPECTROSCOPY REPORT, 1958-1959, by W. C. Price, G. R. Wilkinson and others. Final technical rept. no. 1, 1 Nov 58-31 Oct 59 on Contract DA 91-591-EUC-969. Oct 59, 155p. 27 refs.
Order from LC mi$7.50, ph$24.30 PB 146 831

Subject of Research: (I) The infrared spectra of some ionic and molecular crystals using high resolution over wide wavelength ranges and at temperatures down to that of liquid helium. (II) The absorption spectra of different materials (in solid, liquid or gas phase) in the infrared and in the vacuum ultraviolet.

Istituto di Fisica Superiore, Universita di Pavia (Italy).
A MICROWAVE SPECTROGRAPH FOR PARAMAGNETIC RESONANCE. SOME PRELIMINARY RESULTS OBTAINED ON TWO NEW FREE RADICALS, by A. Giarda, G. Lanzi and others. Final technical rept. for Sep 58-Aug 59 on Contract DA 91-508-EUC-396. Nov 59, 22p. AD-232 704.
Order from LC mi$2.70, ph$4.80 PB 146 834

A description is given of a microwave reflection spectrograph which operates at a fixed frequency of about 9300 mc, corresponding to a wavelength of about 3 cm in vacuum. The waveguide circuit includes a resonant cavity wavemeter for frequency measurements. The branch which contains the klystron generator is equipped with a ferrite insulator to prevent reflections toward the klystron; another branch contains the attenuators and matching devices. The electromagnetic field in the microwave region is generated by a 723 A/B reflex klystron at a frequency

of 9370 mc with an output power of 20 megawatts. The resonant cavity is mechanically tuned with a screw which acts on the upper side of the klystron. The electromagnetic field is fed into the waveguide through a small coaxial cable. The detector is a 1 N 236 silicon diode rectifier which is capable of detecting the signal (9300 mc AC voltage modulated by 70c AC voltage). Measurements were made of the line widths and spectroscopic splitting factors of the quinazoline bisulfate and phenothiazine perchlorate free radicals.

Massachusetts Inst. of Tech., Cambridge.
SOLID STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 32 on Contract Nonr-1841(34). 15 Apr 59, 102p. 46 refs.
Order from LC mi$5.70, ph$16.80 PB 146 031

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Zeeman splittings of paramagnetic atoms in crystalline fields
Crystalline field calculation
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Energy bands and approximate potentials
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Solid-state and molecular theory group programming notes
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Properties and interactions of the helium atom
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Electronic wave functions for polyatomic molecules
(See also PB 144 229)

Spectroscopy Lab., Mass. Inst. of Tech., Cambridge.
INVESTIGATION OF FAR INFRARED SPECTRA, by Richard C. Lord. Rept. for Mar 58-Aug 59 on Experimental Techniques for Materials Research, Contract AF 33(616)5578. Feb 60, 34p. 38 refs. WADC Technical rept. 59-498.
Order from OTS $1.00 PB 161 738

Applications of a small grating spectrometer to problems of molecular structure by means of infrared absorption spectra in the region 50 - 300 cm^{-1} are reviewed. Infrared spectra in the range 50 - 300 cm^{-1} are reported and discussed briefly for methyl amine, hydrazine and trimethylene oxide, and in the range 50 - 600 cm^{-1} for cyclopentane, cyclohexane, cycloheptane, cyclooctane, oxycyclopentane (tetrahydrofuran) and 1,4-dioxycyclohexane (dioxane). Isolated low frequencies are given for thiacyclobutane, disilylacetylene and dimethyl acetylene. New values for the thermodynamic functions of hydrazine are given, and values from the literature are included for diborane and cyclobutane. (Author)

Washington U., Seattle.
A MASS SPECTROMETRIC STUDY OF NEGATIVE ION FORMING REACTIONS IN OXYGEN, by P. L. Randolph and R. Geballe. Technical rept. no. 6 on Contract DA 04-200-ORD-664. 1 Aug 58, 99p. 63 refs. OOR rept. 442.8-P.
Order from LC mi$5.40, ph$15.30 PB 137 902

Willow Run Labs., U. of Michigan, Ann Arbor.
RAPID-SCAN SPECTROSCOPY WITH A FABRY-PEROT INTERFEROMETER, by R. W. Terhune and C. W. Peters. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. May 60, 15p. 6 refs. 2900-157-R.
Order from LC mi$2.40, ph$3.30 PB 147 364

The construction and operation of a variable-spacing Fabry-Perot interferometer that could be used at scanning rates up to 500 scans per second is described. Multilayer interference coatings were used for reflecting surfaces in the near infrared. The high spectral luminosity of the interferometer made its use favorable in low orders for rapid-scan spectroscopy, and in high orders in combination with a grating spectrometer for greater spectral resolution. (Author)

Optics

Avco Corp., Wilmington, Mass.
MIE SCATTERING IN THE FORWARD AREA, by R. Penndorf. Scientific rept. no. 2 on Research on Aerosol Scattering in the Infrared, Contract AF 19(604)5743. Feb 60, 91p. 18 refs. Technical rept. RAD-TR-60-10; AFCRC-TN-60-285.
Order from LC mi$5.40, ph$15.30 PB 146 907

The scattering of light is investigated from a theoretical point of view. After explaining the basic Mie formulas, several useful scattering functions are defined. The scattering pattern for the forward, sideward, and backward area is briefly described, followed by a very detailed investigation for the forward direction, which is based on all available data computed according to the Mie formulas. A wide range of refractive indices n from $n = 1.05$ to $n = 2.0$ have been selected, and all values of i_θ and p_M are extensively listed in the appendix. The behavior of these scattering coefficients is investigated and described in detail. This is followed by a careful investigation of practical limits for the Mie region, which can be defined only arbitrarily. Methods are developed for computing the scattering functions by simple means. Applications of these theoretical data are given to compute the angular Mie cross section and the volume-scattering coefficient by a graphical method. These scattering values can be derived also for given size distributions of the aerosol.

Syracuse U. [Research Inst.] N. Y.
THIN FILMS WHICH PRODUCE PHOTOELECTRIC AND PHOTORESISTIVE EFFECTS, SECTION I AND II (OF FOUR SECTIONS) by Werner Beyen, Donald Bode and others. Final engineering rept. on

Contract W33-038-ac-15160. 1 Apr 55, 37p. 8 refs. Physics rept. 101-35; AD-60 906.
Order from LC mi$3.00, ph$6.30 PB 146 950

Section I contains a description of apparatus and techniques for the measurement of infrared photoconducting devices, Section II contains a summary of the electrical and optical properties of PbTe films.

Willow Run Labs., U. of Michigan, Ann Arbor.
THE EFFECT OF FILM-THICKNESS VARIATIONS ON COHERENT LIGHT, by Arthur L. Ingalls. Rept. on Project Michigan, Contracts DA 36-039-sc-78801, AF 33(600)38019, and AF 30(635)2905. Oct 59, 15p. 3 refs. 2900-88-R.
Order from LC mi$2.40, ph$3.30 PB 146 829

This report describes the experiments which measured perturbations in monochromatic coherent light caused by variations in film thickness, and discusses the results. The introduction of commercial photographic film into the aperture of an optical system disturbs the coherence of the transmitted light, because of the variations in thickness and refractive index present in the film. Such variations in film may be made visible, as contour lines, by light interference pattern were measured, and calculations of light-path variations made. A qualitative analysis showed that film-base thickness-variation was primarily responsible for deterioration of coherence. Formulas are given which show the effect of film variations on coherent light for both use and measurements; and figures are included which show the distribution of film quality.

Solid State Physics

Army Engineer Research and Development Labs., Fort Belvoir, Va.
OPTICAL AND ELECTRON MICROSCOPY OF SODIUM AND POTASSIUM AZIDES, by Johann Joebstl and Hyman Rosenwasser. 27 Apr 59, 108p. 10 refs. Technical rept. 1577-TR; AD-219 245.
Order from LC mi$5.70, ph$16.80 PB 147 462

Crystal habits of sodium and potassium azides have been studied by optical and electron microscopy. The growth features are illustrated with photomicrographs. Observations have also been made on the effects of aging, etching, and heating of these azides. (Author)

Conservatoire des Arts et Métiers, Paris (France).
DYNAMICAL THEORY OF THE REFLECTION OF X-RAYS ON CURVED CRYSTALS, by D. Taupin. Technical (Final) rept. on Contract AF 61(052)51. Jan 60, 34p. 10 refs. AFOSR-TR-60-30.
Order from LC mi$3.00, ph$6.30 PB 146 434

A dynamical theory is applied to perturbated crystals. It allows for a perturbation being regular and continuous, and depending on one geometrical coordinate; this coordinate is perpendicular to the reflecting plan planes and to the crystal surfaces.

Cornell U., Ithaca, N. Y.
INVESTIGATION OF ATOMIC PHENOMENA OCCURRING ON AND NEAR THE SURFACES OF SOLID, by Richard C. Bradley. Final rept. on Contract AF 18(600)674, Task II. 29 Feb 60, 11p. 26 refs. AFOSR-TR-60-45.
Order from LC mi$2.40, ph$3.30 PB 146 433

Field emission microscopy has been used for studying the surface of an alloy, and the kinetics of metals adsorbed on metal substrates. Mass spectrometry has been used to study the nature and properties of secondary ions, surface and bulk compositions, and surface and bulk kinetics.

Eagle-Picher Research Labs., Miami, Okla.
RESEARCH ON GROWING OF CADMIUM SULFIDE CRYSTALS FOR DOSIMETER PURPOSES, by J E. Powderly and K. E. Bean. Quarterly rept. no. 3, 17 Oct 57-17 Jan 58, on Contract DA 36-039-sc-73270. [1958] 64p. 4 refs.
Order from LC mi$3.90, ph$10.80 PB 137 660

Runs can now be consistently reproduced to provide single crystals of large size and of good crystalline structure. Single crystallites weighing in the order of 50 grams are regularly produced. Location of these impurities in the crystals are consistent with the vapor pressure of their sulfides. (See also PB 137 662)

General Electric Research Lab., Schenectady, N. Y.
EFFECT OF Li-B ION PAIRING ON Li^+ ION DRIFT IN Si, by E. M. Pell. Scientific rept. no. 4 on Contract AF 19(604)5551. 28 Apr 60, 18p. 7 refs. AFCRC-TN-60-386.
Order from LC mi$2.40, ph$3.30 PB 147 359

When Li^+ and B^- ions are present simultaneously in Si, relatively immobile Li-B ion pairs are formed. Only those Li^+ ions which have not become paired with B^- are free to diffuse through the Si, and measurement of the effective diffusion rate of the Li^+ can thus be used to determine the fraction of Li^+ paired. Such measurements have been made in the range 0^oC to 100^oC using the method of ion drift in a pn junction. The results agree well with the Reiss model for ion pairing, yielding a distance of closest approach between Li^+ and B^- of 2.5 to 2.7 ^oA. This value is larger than given by the sum of Li^+ and B^- radii; it is roughly equal to the distance from a lattice atom site to the next-nearest interstitial site (2.72 Å). The kinetics of the ion pairing reaction have been investigated by the same technique. The resulting value for the capture radius of the B^- ion agrees satisfactorily with theory. (Author)

Illinois U., Urbana.
ELECTRON MOBILITY AND SCATTERING PROCESS IN AgBr AT LOW TEMPERATURES, by Dwight C. Burnham, Frederick C. Brown, and Robert S. Knox. Technical note no. 3 on Contract AF 49(638)579. Mar 60, 48p. 41 refs. AFOSR-TN-60-419.
Order from LC mi$3.30, ph$7.80 PB 146 930

The Hall effect for electrons released by light in high-purity crystals of AgBr has been studied experimentally in the temperature range 4^{o} to 120^{o}K. The observed mobilities exceed 20,000 cm^2/volt-sec at very low temperatures. The general features of the dependence of low-field Hall mobility on temperature can be understood by comparison with standard theory. A nearly exponential dependence of mobility on 1/T is observed from 40^{o} to 120^{o}K, as predicted for scattering by optical vibrations of the lattice. The slope of the log μ versus 1/T data agrees quite well with the Debye θ for the longitudinal optical mode as deduced from Reststrahl data. Below 40^{o}K the observed mobilities can be explained in terms of a combination of the effects of optical, acoustical and charged impurity scattering. The last process appears to dominate below 15^{o}K. High-field effects are observed which can be explained by classical transport theory assuming a conduction band of standard form as well as isotropic scattering. (Author)

Illinois U., Urbana.
THE INTERACTION OF DISLOCATIONS WITH AN APPLIED STRESS IN ANISOTROPIC CRYSTALS, by G. de Wit and J. S. Koehler. Technical rept. no. 6 on Contract Nonr-1836(26). June 59, 125p. 14 refs. AD-218 496.
Order from LC mi$6.30, ph$19.80 PB 147 460

The differential equation of equilibrium is derived for a dislocation pinned at 2 points in the same glide plane in an elastically anisotropic crystal with an applied stress. It is assumed that the dependence of the dislocation energy on the geometry of the dislocation line is accounted for by using an energy per unit length, E, which for fixed Burgers vector is a function only of θ the angle between the Burgers vector and the dislocation segment. A parametric solution of the differential equation is found in terms of E and its derivatives. When the orientation dependence of E is approximated by that of the elastic energy per unit length of a long straight dislocation, numerical work done for some real face centered cubic and body centered cubic crystals indicates that the first few terms in a Fourier expansion give a good fit to E. Using this expansion, the solution of the differential equation is plotted so that only one curve is needed to obtain the equilibrium shape of the dislocation for all values of the stress. Appreciable deviation from a circle is found. The above information about dislocation shape versus applied stress, together with some simple assumptions concerning dislocation density enables one to calculate the average strain produced in a crystal under applied stress when dislocations are present as compared to a crystal with no dislocations. (Author)

Liége U. (Belgium).
NUCLEAR QUADRUPOLE RESONANCE IN IRRADIATED ORGANIC CRYSTALS AND IN A SEMICONDUCTOR ELECTRON SPIN RESONANCE IN CARBONACEOUS ROCKS, by Jules Duchesne. Technical scientific note no. 1 on Contract AF 61(052)167. 31 Jan 60, 44p. 15 refs. AFOSR-TN-59-1214.
Order from LC mi$3.30, ph$7.80 PB 147 112

The intensity of quadrupole lines is used as a method for the study of the damage induced by high energy radiation in solid matter. Thermally treated irradiated compounds, which are thereafter re-irradiated, are especially considerd. In this connexion, the origin of radioprotection phenomena, and the behavior of the interactions between centers perturbed by irradiation, are studied further. Not only gamma-rays are used, but also X-rays and neutrons. The new method is successfully applied to a semiconductor. Parallel use of quadrupole spectroscopy and electron spin resonance is found highly valuable. (Author)

Lockheed Aircraft Corp., Sunnyvale, Calif.
EFFECTS OF APPLIED ELECTRIC FIELDS ON PARAMAGNETIC RESONANCE IN CHROME ALUMS, by M. E. Browne. Rept. on Physical Electronics. Apr 60, 21p. 13 refs. LMSD-288212.
Order from LC mi$2.70, ph$4.80 PB 147 366

The paramagnetic resonance spectra of single crystals of potassium chrome alum and ammonium chrome alum have been investigated in the presence of applied electric fields at 9.3 kmc in the temperature range $4\text{-}300^{o}$K. The measurements were made in an effort to detect the possible existence of a term of the form $\xi \mu_o \vec{\sigma} \cdot \vec{E}$ in the interaction Hamiltonian for an electron in an electromagnetic field. Such a term corresponds to the existence of an electron electric dipole moment and would result in a lifting of Kramers' degeneracy for a magnetic ion in a crystalline field. No such term was observed, and the upper limit on ξ obtained was $\xi < 0.007$. A dependence of the dielectric loss on electric field was observed in both alums at microwave frequencies. (Author)

North Carolina U., Chapel Hill.
ELECTRIC AND MAGNETIC PROPERTIES OF VERY THIN FILMS WITH SPECIAL EMPHASIS ON SUPERCONDUCTIVITY, by Rolfe E. Glover, III. Annual summary rept. for 1 June 58-31 May 59 on Contract Nonr-855(08). [1959] 16p. 3 refs.
Order from LC mi$2.40, ph$3.30 PB 146 846

Attempts were made to measure the dependence on temperature of the critical current in thin superconducting films. Sharp peaks in the current density are found at the 2 edges of the film. A new cryostat was completed to maintain constant temperature in the range from 1^{o} to 20^{o}K.

Raytheon Co., Waltham, Mass.
SINGLE CRYSTAL GROWTH OF THE GARNET TYPE OXIDES. PART I. PHASE RELATIONS IN THE SYSTEM Fe_2O_3-Fe_3O_4-$YFeO_3$ IN AIR, by H. J. Van Hook. Scientific rept. no. 1 on Contract AF 19(604)5511. 29 Jan 60, 39p. 14 refs. AFCRC-TN-60-162.
Order from LC mi$3.00, ph$6.30 PB 147 056

Measurements have been made of temperature and ternary composition for coexisting liquid and crystalline phases on the air isobar in the system Fe_2O_3-Fe_3O_4-$YFeO_3$ with particular regard to the stability range and compositional limits of yttrium-iron garnet.

Phase equilibrium relationships were determined by conventional quenching techniques combined with measurements of loss in weight at the reaction temperature to locate true ternary compositions. The intersection of the air isobar with the ternary univarient boundary curve for coexisting magnetite, garnet and liquid phases results in an eutectic-type situation at the composition $Y_{0.27}Fe_{1.73}O_{2.87}$ and $1469^{o} \pm 2^{o}C$. A similar intersection of the isobar with the boundary curve for coexisting garnet, orthoferrite, and liquid phases gives rise to a peritectic-type reaction at $1555^{o} \pm 3^{o}C$ and $Y_{0.44}Fe_{1.56}O_{2.89}$. The yttrium-iron garnet crystallizing from liquids within these temperature and composition limits contains up to 0.5 mole percent iron oxide in excess of the stoichiometric formula in terms of the starting composition 37.5 mole percent Y_2O_3, 62.5 mole percent Fe_2O_3. Loss of oxygen in the garnet phase is appreciable in this temperature range; approximately 3 mole percent FeO is present at $1470^{o}C$. Solubility of excess of iron oxide and partial reduction in air are invarient conditions during the growth process and the composition of the garnet formed can only be changed by a change in oxygen pressure.

Watertown Arsenal Labs., Mass.
DEBYE TEMPERATURE OF CARBONYL IRON, by Charles P. Gazzara. May 60, 24p. 26 refs. Technical rept. WAL TR-805.2/1.
Order from LC mi$2.70, ph$4.80 PB 146 161

The Debye characteristic temperature, Θ, of carbonyl iron has been determined as being between $433^{o}K$ and $445^{o}K$ at an ambient temperature of $310^{o}K$ from an X-ray diffraction study utilizing both monochromatized and filtered radiation by both a stationary and scanning slit method. (Author)

Willow Run Labs., U. of Michigan, Ann Arbor.
POLARIZATION, MICROWAVE DISPERSION, AND LOSS IN HIGH-PERMITTIVITY FERROELECTRICS, by Howard Diamond. Rept. on Proj. Michigan, Contract DA 36-039-sc-78801. Jan 60, 103p. 33 refs. 2900-121-T; AD-231 701.
Order from LC mi$5.70, ph$16.80 PB 147 304

An analysis was conducted of experimental data, polarization, dispersion, and loss processes in high-permittivity ferroelectrics. The study proceeds from the observation that, according to published data, polycrystalline $BaTiO_3$ and similar compositions show strong relaxation in permittivity at microwave frequencies. This phenomenon is shown to be generally related to polarization and loss properties of the dielectric. Processes of particular interest in accounting for the microwave relaxation are: (a) domain effects, (b) possible dipolar or molecular polarization, and (c) mechanical effects produced by piezoelectric and electrostrictive coupling. The conclusions that may be drawn from this work are as follows: (1) the field sensitivity of the incremental permittivity of polycrystalline ferroelectrics is not a domain effect, but results from an induced ferroelectric state in non-ferroelectric grains; (2) nonlinear permittivity under electric fields must necessarily be accomplished by substantial thermal sensitivity; (3) orientation of the domains does not contribute to microwave dispersion; (4) molecular or dipolar relaxation does not occur at microwave frequencies for $BaTiO_3$ single crystals; therefore this is not a mechanism for dispersion in the ceramic, and (5) dielectric loss as well as piezoelectric and electrostrictive activity would result in microwave dispersion in high-permittivity ferroelectrics. (Author)

Theoretical Physics

Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.
OBSERVATIONS OF A RELATIVISTIC SPACE TRAVELER, by J. Richard Haskins. 1 June 59, 9p. 7 refs. ARGMA TR 1C31R; AD-219 064.
Order from LC mi$1.80, ph$1.80 PB 147 579

The question of asymmetrical aging in space travel is discussed regarding the possibility of distant clocks apparently running backward as observed by an accelerated space traveler. Results show that this apparent backward running of clocks is consistent with apparent reabsorption of photons emitted earlier by a distant star. (Author)

Cambridge U. (Gt. Brit.)
THE ANAYLTIC PROPERTIES OF PERTURBATION THEORY, by J. C. Polkinghorne and G. R. Screaton. Technical (scientific) note no. 4 on Contract AF 61(052)233. Jan 60, 17p. 12 refs. AFOSR-TN-60-277.
Order from LC mi$2.40, ph$3.30 PB 146 442

A general method is given for locating the complex singularities of the contributions from Feynman diagrams regarded as functions of the external scalar products. The method is illustrated by application to the third-order vertex function. (Author)

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE SHIELDING OF A FIXED CHARGE IN A HIGH DENSITY ELECTRON GAS, by J. S. Langer and S. H. Vosko. Technical rept. no. 8 on Contract Nonr-760(13). [1959] 31p. 7 refs.
Order from LC mi$3.00, ph$6.30 PB 146 047

The shielding of a small fixed charge in a high-density electron gas is calculated by means of a technique similar to that used by Gell-Mann and Brueckner for calculating the correlation energy. A closed expression for the density of displaced electrons is derived and evaluated numerically for several densities of the electron gas. An asymptotic form is also given. (Author)

Chicago U., Ill.
QUASI-FINITENESS OF THE INTERACTION HAMILTONIAN OF CERTAIN QUANTUM FIELDS, by I. E. Segal. Technical note no. 1 on Contract AF 49(638)666. Apr 60, 14p. 9 refs. AFOSR-TN-60-445.
Order from LC mi$2.40, ph$3.30 PB 147 119

Forschungsinstitut für Physik der Strahlantriebe, e. v., Stuttgart (West Germany).
STOCHASTIC THEORY OF TRANSPORT PHENOMENA IN A REACTING PLASMA AT EXTREME TEMPERATURES, by H. J. Kaeppeler. Final rept. on Contract AF 61(514)1244. Mar 58, 109p. 28 refs. WADC TR-58-353; AD-155 704.
Order from LC mi$5.70, ph$16.80 PB 147 685

One of the essential tasks of theoretical plasma research is the development of an appropriate kinetic theory of nonequilibrium plasma behavior. The research reported on in this paper deals with attempts to establish such a theory. It is believed that many details of mathematical probability theory, especially the probability theory due to A. N. Kolmogoroff, are particularly well suited to describe the behavior of a system of particles, here a multi-component reacting plasma. An extension of Grad's method, including the presence of electric and magnetic fields, to the case of a non-isothermal multi-component reacting plasma is shown.

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
QUANTUM STATISTICAL PAIR DISTRIBUTION FUNCTION. GENERAL THEORY AND ITS APPLICATION TO THE ELECTRON GAS, by Shigeji Fujita. Doctoral thesis. Rept. on Contract AF 18(600)1315. Mar 60, 91p. 13 refs. Technical note BN-204; AFOSR-TN-60-435.
Order from LC mi$5.40, ph$15.30 PB 146 929

A general theory for calculating the pair distribution function for a quantum statistical system is developed and applied to the electron gas. A cluster integral expansion for the pair distribution function of both quantum and classical systems is derived. The simple chain approximation to the modified interaction is responsible for the transfer of a plasmon in the case of low temperature electron gas. The pair distribution function up to the first order in the modified interaction is calculated. A new expression which relates the internal energy with the pair distribution function is derived, assuming a system of many particles interacting through pair forces. This is used to calculate the ground-state energy of an electron gas. The result is in agreement with the work of Gell-Mann Bruckner.

Institute of Theoretical Physics, Stanford U., Calif.
MOTION OF A GYROSCOPE ACCORDING TO EINSTEIN'S THEORY OF GRAVITATION, by L. I. Schiff. Technical note no. 17 on Contract AF 49(638)388. Apr 60, 28p. 50 refs. AFOSR-TN-60-449.
Order from LC mi$2.70, ph$4.80 PB 147 355

It is pointed out that only the precession of the perihelion of the orbit of the planet Mercury provides an experimental verification of general relativity theory that goes beyond special relativity and the equivalence principle. In order to provide the theoretical basis for a new experimental test of the theory, the properties of a spinning test particle, or torque-free gyroscope, are calculated in detail.

Institute of Theoretical Physics, Stanford U., Calif.
PHOTOEFFECT FROM THE L SHELL, by R.H. Pratt. Technical note no. 15 on Contract AF 49(638)388. Apr 60, 37p. 20 refs. AFOSR-TN-60-417.
Order from LC mi$3.00, ph$6.30 PB 147 356

The differential cross section for photoeffect from an atomic shell is shown to be almost independent of principal quantum number, apart from normalization, for energies well above threshold. The high-energy limits of the total cross sections for the three L subshells are calculated exactly with methods previously applied to the K shell, and extrapolations are made to cover the entire high-energy region. A procedure is indicated to account for the effects of electron screening. It is found that the contribution from the P shells is not negligible in heavy elements. Agreement with experiment is good. (Author)

Johns Hopkins U. School of Engineering, Baltimore, Md.
STEADY, FINITE MOTIONS OF A CONDUCTING LIQUID, by Robert R. Long. Technical rept. no. 8 on Contract Nonr-248(31). June 59, 15p. 8 refs. AD-219 397.
Order from LC mi$2.40, ph$3.30 PB 146 428

In certain cases of steady motion of a conducting fluid in a magnetic field the primitive equations may be integrated once, yielding a second order, partial differential equation in the stream function. This equation is highly non-linear in general but for certain choices of basic flow and magnetic fields it is tractable. Several arbitrary functions of integration have to be evaluated to make the analysis useful. This may be done in a region that remains undisturbed. A short discussion is given to suggest a procedure for deciding in a special case whether this undisturbed region is upstream or downstream. (Author)

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
A DISCUSSION OF TWO INCOMPRESSIBLE MAGNETOHYDRODYNAMIC FLOWS, by Keith P. Kerney. Part 3 of rept. on Research on the Comprehensive Theory of Plasma States and Phenomena, Contract AF 33(616)5693. Oct 59, 59p. 7 refs. Technical rept. 399; WADD Technical rept. 59-486, Part 3.
Order from LC mi$3.60, ph$9.30 PB 147 780-3

This report is a presentation of approximate solutions to two problems involving the flow of an incompressible viscous fluid having low electrical conductivity through a transverse magnetic field. The first problem is that of simple pipe flow. It is shown that the effects of the Hall current and ion slip can be incorporated into the continuum solution, to a first order, and that the effects of induced properties are of the order of magnetic Reynolds number. The second problem involves the Falkner-Skan flow; it is shown that the external magnetic field must be of the order of the square root of the velocity divided by the length for similar solutions to exist. Further analysis shows that, unless the conductivity vanishes outside the boundary layer, the class of magnetic fields required for similar solutions leads to singularities in the external field. (Author)

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.

THE EQUATION OF STATE OF AN IONIZED GAS, by George K. Bienkowski. Master's thesis. Part 2 of rept. on Research on the Comprehensive Theory of Plasma States and Phenomena, Contract AF 33(616)5693. Sep 59, 68p. 10 refs. Technical rept. 398; WADD Technical rept. 59-486, Part 2.
Order from LC mi$3.90, ph$10.80 PB 147 780-2

Electrically conducting gases, because of the long-range coulombic forces acting between the particles, are not amenable to the usual treatment of dilute-gas kinetic theory. Calculation of the equilibrium equation of state through the molecular approach must include the forces between particles if it is to correspond to physical reality. In the methods of kinetic theory this implies that potential energy and thus spatial distribution of particles is not negligible. Since it can be shown that the exact equation of state can be computed with the additional knowledge of the distributions of particle-pairs, equilibrium pair distribution functions were investigated. The existing Debye-Huckel approximation as applied to an ionized gas was found to have some limitations as well as theoretical difficulties. The equations which can determine the distribution functions are hopelessly non-linear except for asymptotic regions and therefore approximate solutions are derived for the non-linear range and quantum effects in the ion-electron interactions are included. The resulting distributions are used to calculate the equation of state. Higher order effects resulting from the volume of the particles and attractive forces between the charged and neutral particles are evaluated and found to be at least of an order of magnitude smaller than the coulombic effects in the region under consideration.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.

A MICROSCOPIC ANALYSIS OF MAGNETO-GAS-DYNAMICS, by Eugene E. Covert. Report presented at the Third Biennial Gas Dynamics Symposium, August 24-26, 1959, Northwestern U., Evanston, Ill. [1959] 48p. 45 refs. Technical rept. 395.
Order from LC mi$3.30, ph$7.80 PB 147 267

The kinetic theory approach to magneto-gas-dynamics is discussed. The several methods of considering interactions, in which the long range forces are of importance, are compared critically. In particular, the effects of the magnetic field on the particle interactions and their trajectories are shown to introduce anisotropies in magneto-gas-dynamics. The effects of these anisotropies are briefly discussed. (Author)

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.

A REVIEW OF THE LITERATURE OF PLASMA PHYSICS, by Eugene F. Covert and Keith Kerney. Part 1 of rept. on Research on the Comprehensive Theory of Plasma States and Phenomena, Contract AF 33(616)5693. July 59, Second printing. 177p. 677 refs. Technical rept. 373; WADD Technical rept. 59-486, Part 1; AD-227 556.
Order from LC mi$8.10, ph$27.30 PB 147 780-1

The level of development of plasma physics is discussed. It is found that the present theories account for the experimental effects if: (1) the plasma is sufficiently dense that the time between collisions is small compared to the time an atom stays in the excited state but is sufficiently rare that the volume of the particles making up the plasma is very much smaller than the volume of plasma; (2) the potential energy between particles is the sum of the particles potential energy; and (3) the excitations are sufficiently weak, or the duration of the event is sufficiently short, that linearized theories are applicable. The complexity of the basic equations allows the inference to be drawn that it is possible for interesting phenomena to exist which are not yet discovered, and that the known but unexplained phenomena are contained within these equations. (Author)

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.

HARDNESS OF THE AXIALLY-SYMMETRIC MAGNETIC PISTON, by Allen B. Schaffer. 8 Jan 60, 30p. 4 refs. STL/TR-60-0000-09011.
Order from LC mi$2.70, ph$4.80 PB 146 925

A magnetic field travelling down a transmission line is to be used as a magnetic piston to push plasma. This report considers the effect of plasma leakage through the magnetic piston. By means of an order-of-magnitude treatment of the momentum equation, an expression which gages the leakage is derived. This expression can be useful in estimating the leakage and in comparing various designs for hardness to leakage. The leakage is found to vary inversely as the magnetic Reynolds No. (Author)

Physical Research Lab. Space Tech. Labs., Inc., Los Angeles, Calif.

A STUDY OF PLASMA STABILITY IN MICROWAVE CAVITIES BY A FREQUENCY-SHIFT ANALOG, by Robert A. Swanson. Rept. on Thermonuclear Propulsion Research, Contract AF 04(647)309. [1959] 15p. 3 refs. TR-59-0000-00812.
Order from LC mi$2.40, ph$3.30 PB 146 839

An equation is derived which relates the pressure change at a perturbed microwave cavity boundary to the change in resonant frequency of the cavity. The equation is used to obtain information on the stability of a plasma confined by microwave fields. (Author)

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.

TRANSVERSE PINCH OSCILLATIONS, by Burton D. Fried. Rept. on Contract AF 04(647)309. 24 Mar 60, 10p. 1 ref. STL/TN-60-0000-09059.
Order from LC mi$1.80, ph$1.80 PB 146 873

It is shown that the oscillations or "bouncing" of a transverse pinch like those observed by Wuerker, et al. are predicted by a simple model in which no trapped magnetic field is assumed.

Physical Research Lab., Space Tech. Labs., Inc., Los Angeles, Calif.
STX--A PROPOSED THERMONUCLEAR DEVICE, by Richard W. Hales. Rept. on Contract AF 04(647)309. 15 Apr 60, 16p. 11 refs. STL/TR-60-0000-09085.
Order from LC mi$2.40, ph$3.30 PB 147 007

A thermonuclear device, STX, is discussed in this design study which would combine the features of the linear and transverse pinches. The name derives from the use of two magnetic fields for containment which are crossed in space and time--that is, orthogonal in space (B_θ and B_z) and in time quadrature. (Author)

University of Southern California. Engineering Center, Los Angeles.
SIMULATION CONSIDERATION FOR THE EXPERIMENTAL INVESTIGATION OF ELECTROMAGNETIC PROPAGATION THROUGH THE PLASMA SHEATH, by Raymond L. Chuan. Technical note on Contract AF 19(604)5722. 29 Feb 60, 23p. 10 refs. USCEC rept. 71-201; AFCRC-TN-60-172.
Order from LC mi$2.70, ph$4.80 PB 146 871

The study of electromagnetic propagation through the plasma sheath surrounding a hypersonic vehicle under controlled laboratory conditions is considered within the capabilities of existing laboratory facilities at the University of Southern California Engineering Center. The severe limitations of the theoretical treatment of the interaction problem because of inadequate understanding of the gasdynamics involved are pointed out; which necessitate experimental studies, provided simulation is adequate and similarity conditions can be met. Scaling parameters are established, and are shown to be generally compatible with laboratory conditions. The advantages of using a wind tunnel for such studies are pointed out; and a current program at USC is described, which provides simulation of actual flight conditions encountered at 300,000 to 450,000 feet altitude. (Author)

Weizmann Inst. of Science (Israel).
ON A MODIFIED BETHE-GOLDSTONE EQUATION, by Amnon Katz. Technical note no. 1 on Contract AF 61(052)337. 1 Feb 60, 39p. 16 refs. AFOSR-TN-60-307.
Order from LC mi$3.00, ph$6.30 PB 146 421

A many fermion system with BCS interaction is treated by a modified BG equation which takes into account a self consistent spreading of the Fermi surface. Our method employs a modified wave function which is an eigenstate of one modified hamiltonian and from which energies are determined by another. Pairs with total momentum o are treated as elementary entities. All modifications are achieved by a "projection operator" which a priori takes care of the interference between pairs due to their statistics. The only case solved is the one where all interacting pairs go into the Cooper state of the modified hamiltonian. The results are identical with those of BCS. (Author)

Thermodynamics

Aeronautical Research Lab., Wright Air Development [Div.] Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL STUDY OF THE INTERACTION OF STRONG SOUND FIELDS WITH FREE CONVECTION BOUNDARY LAYERS, by Arthur L. Sprott, Jack P. Holman, and Frederick L. Durand. Nov 59, 32p. 11 refs. WADC Technical rept. 59-717.
Order from OTS $1.00 PB 161 724

It is demonstrated experimentally that strong progressive sound fields may interact with a free convection boundary layer on a horizontal cylinder in such a manner as to produce increases in heat transfer rates of the order of 100 percent. Shadowgraph flow visualization studies indicate that the mechanism of the interaction is such that a separated flow region on the upper side of the cylinder is produced. No effect on the boundary layer or heat transfer is observed until the sound intensity is raised above a certain critical value. For the experiments described in the paper, the critical sound pressure level ranged from 134 to 138 decibels. In a qualitative analysis of the experimental results it is postulated that the increase in heat transfer is the result of an interaction of the phenomenon of acoustical streaming with the free convection boundary layer. It is also believed that the mechanism of thermoacoustic transduction may be applicable. (Author)

Air Force Missile Development Center, Holloman AFB, N. Mex.
SOLAR FURNACE SUPPORT STUDIES. 1958, 206p. 2 refs. AFMDC-TR-58-7; AD-135 014.
Order from LC mi$9.30, ph$31.80 PB 147 143

Contents:
Preliminary measurements of the solar radiation at Cloudcroft, New Mexico
Notes on the potential performance of the Cloudcroft solar furnace
Suggested methods of aligning the planes of the solar furnace heliostat mirrors into parallelism
Basic optical considerations in the choice of a design for a solar furnace
The loss of energy by absorption and reflection in the heliostat and parabolic condenser of a solar furnace
Calculation of the concentration of a solar radiation through the focal spot of a parabolic mirror
Calculation of the concentration of energy at points outside the focal spot of a parabolic condenser
Rigid-body torsional oscillations of axially supported heliostat mirror
Transient temperature distribution in a thermally irradiated body with variable heat-transfer coefficient
A solar furnace using a horizontal heliostat array

Army Rocket and Guided Missile Agency, Redstone Arsenal, Ala.
COMPRESSIBLE FLOW TABLES k = 1.40 STAGNATION TEMPERATURE CHANGE WITHOUT FRICTION, by C. Hoebich. Rept. on One-Dimensional Compressible Flow Tables for a Perfect Gas in Mach Number Increments of 0.001 (k = 1.40). June 59, 90p. ARGMA TN 1H 1N-5; AD-220 506.
Order from LC mi$4.80, ph$13.80 PB 147 151

Functions are tabulated of Mach numbers for compressible perfect gas. The ratio of specific heats k is 1.40. The increment used in these tables is sufficiently small (0.001 Mach number) to eliminate time-consuming interpolation. (Author)

Georgia Inst. of Tech., Engineering Experiment Station, Atlanta.
CONVECTIVE FLOW DUE TO ACOUSTIC VIBRATIONS IN HORIZONTAL RESONANT TUBES, by Thomas W. Jackson and Harold L. Johnson. Final rept on Contract AF 49(638)459. Mar 60, 40p. 10 refs. AFOSR-TR-60-52.
Order from LC mi$3.00, ph$6.30 PB 146 432

This study consisted of an experimental investigation of the convective flow due to acoustic vibrations in a horizontal resonant tube. The flow was made visible by illuminating smoke particles in the air by means of a 200 watt-second flash filament source and recording the motion photographically.

Guggenheim Jet Propulsion Center, Calif. Inst. of Tech., Pasadena.
ELECTRODE BOUNDARY LAYERS IN DIRECT CURRENT PLASMA ACCELERATORS, by Jack L. Kerrebrock. Technical note no. 1 on Contract AF 49(638)758. Jan 60, 52p. 7 refs. AFOSR-TN-60-287.
Order from LC mi$3.60, ph$9.30 PB 146 773

One of the problems which must be faced in the development of direct-current plasma accelerators is that of boundary layer growth on the electrode surfaces. These surfaces must be maintained at a somewhat lower temperature than is desirable in the bulk of the gas flow. The associated reduction in electrical conductivity near the electrode surface, together with the continuous current through the boundary layer, may result in greatly augmented Joule heating near the surface, and increased heat transfer. This phenomenon is treated within the framework of boundary layer theory. It is found that similar solutions for the thermal and viscous boundary layers exist for a certain class of accelerated flows in which the velocity varies as a power of the streamwise coordinate. The solutions show that the heat transfer rate at Mach numbers near unity may be as much as ten times that which would be expected for a normal boundary layer. At higher Mach numbers, the similarity is not precisely valid; however, the analysis indicates qualitatively that a stagnation enthalpy overshoot may occur in the high temperature portion of the boundary layer as a result of the electromagnetic acceleration. (Author)

Columbia U., New York.
THE MEASUREMENT OF THE THERMAL CONDUCTIVITY OF GASES AT HIGH TEMPERATURE, by Charles F. Bonilla, Barry L. Tarmy, and C. S. Lee. Progress rept. on Contract Nonr-266(11). 20 Jan 54, 33p. 13 refs. CU-1-54-Nonr-266(11)-Ch.E; AD-35 482.
Order from LC mi$3.00, ph$6.30 PB 147 156

A method for the measurement of the thermal conductivity of gases is derived which is independent of radiation. The method employs a hot-wire cell with its wire heated by a sinusoidal ac superimposed upon a dc. The operating conditions under which the radiation introduced no appreciable error are indicated as well as the inherent limitations of the method. Optimum cell design and operating conditions are suggested. Results indicated that it is possible to obtain the thermal conductivity of gases at high temperature from electrical responses which are sufficiently sensitive to thermal conductivity but are insensitive to wire-to-wall radiation. The phase lag of the third harmonic of voltage produced across the wire with respect to some standard appeared to be a sensitive indicator of thermal diffusivity for gases at high temperatures. It appears to be possible to use the amplitude of the third harmonic to measure the thermal diffusivity of liquids.

Institute of Research, Lehigh U. [Bethlehem, Pa.]
AN INTERFEROMETRIC STUDY OF SHOCK TUBE BOUNDARY LAYERS, by John R. Asbridge. Doctoral thesis. Technical rept. no. 14, 1955-1959 on Contract N7onr-39302. 10 Apr 59, 105p. 28 refs.
Order from LC mi$5.70, ph$16.80 PB 145 944

Boundary layers in the hot gas flow behind the shock wave on the walls of a rectangular shock tube have been studied for eleven flow conditions by observing their density structure with a Mach-Zehnder interferometer. The boundary layers are observed to be thin and slowly growing at first, possessing the structure and growth rate predicted by Mirels for laminar layers. This laminar structure extends for only a limited distance behind the shock. Then the boundary layer profile gradually becomes similar to that which has been observed for steady turbulent layers, although a systematic difference is detected for most flow conditions. The structure of the boundary layer during the transition from laminar to turbulent flow is observed to be consistent with the turbulent spot mechanism of transition, but no direct evidence for turbulent spots has been found. Free stream density variations coincident with the boundary layer growth are observed and presented.

Laboratoire Mèditerranéen de Recherches Thermodynamiques (France).
THE SPUTTERING OF MOLECULES OF A THIN LAYER BY A LOW DENSITY SUPERSONIC FLOW IN FREE MOLECULAR REGIME, by F. Marcel Devienne and Georges M. Forestier. Technical note on Contract AF 61(052)124. Dec 59, 30p. 6 refs. AFOSR-TN-60-317.
Order from LC mi$2.70, ph$4.80 PB 147 111

The study of the stability of cadmium and antimony thin layers has been effected in a rarefied gas supersonic wind tunnel either in an air or an argon flow. Radioactive isotopes have been used in this study. It has shown that at a same temperature, the cadmium and antimony thin layers are less stable in a gas flow at great speed, than in vacuum. (Author)

Materials Lab., Wright Air Development Div., Wright-Patterson AFB, Ohio.
A RELAXATION TIME TECHNIQUE FOR MEASUREMENT OF THERMAL DIFFUSIVITY, by George Sonnenschein and Robert A. Winn. Rept for Sep 58-May 59 on Materials Analysis and Evaluation Techniques. Feb 60, 29p. 7 refs. WADC Technical rept. 59-273.
Order from OTS $0.75 PB 161 752

A method has been developed for measuring the thermal diffusivity of solids under conditions of one-dimensional transient heat flow in a semi-infinite plate of finite thickness, adiabatically insulated at one face and subject to a constant thermal flux at the other. The method involves measurement of the time elapsed from start of exposure and of the temperature rise at a point along the direction of heat flow. The feasibility of the technique has been demonstrated on aluminum, Armco iron, copper, yttrium, and on a plastic laminate, covering the diffusivity range from 7 x 10-4 to 1.0 cm^2/ sec. and temperatures between 25 and 950°C. (Author)

Naval Research Lab., Washington, D. C.
THE SUITABILITY OF PLATINUM, MOLYBDENUM, TANTALUM, AND TUNGSTEN AS HIGH-TEMPERATURE LENGTH STANDARDS, by J. L. White. 17 June 58, 19p. 41 refs. NRL Rept. 5159.
Order from LC mi$2.40, ph$3.30 PB 132 840

In view of the increasing need for high-temperature length standards to be used in the design and calibration of apparatus for high temperatures, the thermal expansion data available in the literature for platinum, molybdenum, tantalum, and tungsten have been critically evaluated.

Naval Supersonic Lab., Mass. Inst. of Tech., Cambridge.
SOME APPROXIMATIONS TO THE SOLUTION TO THE BINARY BOUNDARY-LAYER PROBLEM, by Eugene E. Covert. Rept. on Contract AF 49(638)245. Sep 59, 30p. 10 refs. Technical rept. 390; AFOSR-TN-59-1091.
Order from LC mi$2.70, ph$4.80 PB 147 781

Some approximate relations between shear, mass transfer and heat transfer are developed for the case of arbitrary external velocity, blowing distribution, and wall temperature. The approximations are compared with known solutions and are in satisfactory agreement with them. (Author)

Physical Research Lab., Space Tech. Lab., Inc., Los Angeles, Calif.
THE SUPERFAST PINCH EXPERIMENT, by Vernal Josephson. Rept. on Contract AF 04(647)309. 2 Nov 59, 29p. TR-59-0000-09880.
Order from LC mi$2.70, ph$4.80 PB 146 819

An assembly designed to accelerate deuterons to ~ 10kev by means of a radially converging magnetic piston has been constructed and tested. The emphasis in this report is on design features and operational problems encountered.

Republic Aviation Corp., Farmingdale, N. Y.
STATISTICAL THERMODYNAMICS APPLIED TO CHEMICAL KINETICS OF COMBUSTION, by Edwin F. Fricke. Rept. on Proj. MX-773. 1 Oct 47, declassified 30 Dec 55, 515p. Rept. no. EDR-22-407; ATI-22 410.
Order from LC mi$11.10, ph$78.90 PB 147 392

A general summary of the fields of thermodynamics is presented. The thermodynamic functions for all of the important combustion gases have been tabulated at 100° intervals from 300° to 5000° Kelvin. Several fuel gases have been investigated. The theoretical combustion equation for n-pentane has been developed for all types of air-fuel ratios. A complete survey of the methods of calculating the thermodynamic functions has been included. Atomic and molecular energy levels have been discussed in detail. All types of homogeneous gas reactions have been worked out. (Portions of this report will not reproduce well)

[Space Sciences Lab.], General Electric Co., Philadelphia, Pa.
PLASMA JET TEMPERATURE STUDY, by Willard J. Pearce. Rept. for June 58-June 59 on Materials Analysis and Evaluation Techniques, Contract AF 33(616)5848. Feb 60, 111p. 42 refs. WADC Technical rept. 59-346.
Order from OTS $2.50 PB 161 735

Spectral methods for measuring plasma temperatures in the range 5,000 to 15,000°K have been compared on theoretical and experimental grounds. For plasma jets, the best method is to determine the temperature from the intensities of atomic lines or of ionic lines, from the relation I=KgA Exp(-E/kT). Tables of values of the required constants have been compiled and examples of various modifications of the method have been given. Technique and constants have been given which permit determination of radial distributions of temperature with the least difficulty. (Author)

Wave Propagation

Electrical Engineering Research Lab., U. of Texas [Austin].
PROPAGATION STUDIES BETWEEN 18.0 AND 25.5 KMCS, by C. W. Tolbert, A. W. Straiton, and C. O. Britt. Rept. on Contract Nonr-375(01). 10 July 59, 18p. 2 refs. Rept. no. 110.
Order from LC mi$2.40, ph$3.30 PB 147 091

Water vapor losses measurements made during propagation studies in the frequency spectrum of 18.0 to 25.5 kmcs were found to have a maximum value of 0.0245 db/km/gram/m^3 near a frequency of 21 kmcs. Also observed was the possibility of a second maximum near 24 kmcs. The average value of signal strength fluctuations observed in the spectrum was ±0.38 db. The measurements were made between April 22 and May 29 of 1959 by transmitting one way over a 12 km path. (Author)

Electromagnetic Research Corp., Washington, D. C.
INVESTIGATIONS OF GROUND CLUTTER AND GROUND SCATTERING, by Martin Katzin, Edward A Wolff, and Joel C. Katzin. Final rept. on Contract AF 19(604)5198. 15 Mar 60, 97p. 26 refs. Rept. no. CRC-5198-4; AFCRC-TR-60-127.
Order from LC mi$5.40, ph$15.30 PB 146 910

The physical mechanisms which are of importance in ground clutter are discussed, and ground clutter measurements are shown which reveal the presence of these mechanisms. The significance and properties of the radar length tensor (or polarization matrix) are pointed out. The radar length tensor for small circular disks is determined, and curves are shown for certain ranges of aspect. These are used to explain some previously unexplained horizontal/vertical and cross-polarization characteristics of sea clutter. Methods for measuring the radar length tensor are discussed, and typical coherent radar systems for ground scattering measurements are described. A new calibration technique for coherent radars is described which allows ground scattering measurements to be placed on a quantitative basis. (Author) (See also PB 146 911)

Electromagnetic Research Corp., Washington, D. C.
A REVIEW OF THEORIES AND MEASUREMENTS OF RADAR GROUND RETURN, by Edward A. Wolff. Scientific rept. no. 1 on Contract AF 19(604)5198. 29 Feb 60, 67p. 26 refs. Rept. no. CRC-5198-2; AFCRC-TN-60-173.
Order from LC mi$3.90, ph$10.80 PB 146 911

A summary of the principal sea and ground clutter measurement programs is presented and their results are compared. The principal theoretical work is reviewed for both sea and ground return. The theories reviewed include the corrugated surface, drop, and facet theories of sea clutter and the slightly rough surface and thin lossy cylinder theories of ground clutter. In addition, several miscellaneous theories based upon hypothetical statistical descriptions of the surface (such as arrays of spheres) are discussed. A comparison of the theoretical conclusions with the experimental results is made for each theory and the present status of our understanding of ground return is reviewed. (Author)

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
MILLIMETER SCATTERING RANGE AND PRELIMINARY MEASUREMENTS OF SCATTERING FROM METALLIC SPHERES, by C. I. Beard. Rept. on Contract DA 36-039-sc-75012. 2 May 58, 29p. 4 refs. Technical memo. no. EDL-M136.
AD-200 299.
Order from LC mi$2.70, ph$4.80 PB 146 062

A millimeter-wavelength scattering range is described for measuring scattering from random volume and surface distributions. Calibration procedures are given including the angular measurement of scattering from metal spheres of ka = 14.9 and 20.

Electronics Research Lab., U. of California, Berkeley.
NEW RESULTS IN BACK SCATTERING FROM CONES AND SPHERIODS, by Andrejs Olte and Samuel Silver. Rept. on Contract N[7]onr-295(29). 15 July 59, 26p. 13 refs. Rept. no. 90; Series no. 60, issue no. 243; AD-225 150.
Order from LC mi$2.70, ph$4.80 PB 147 092

Experimental results are given for backscattering cross sections of cones, prolate spheroids, and oblate spheroids. A brief resume is given first of the image-plane technique used in measuring cross sections. Calibration data show that for cross sections of the order of that of spheres of 3 in. diameter the attainable accuracy is of better than 0.5 db. Cross section data for various aspects of the targets are compared with geometrical optics cross sections and those obtained by various other theoretical procedures. Some interpretation of the observed phenomena is made in terms of high frequency approximation techniques. (Author)

Lincoln Lab., Mass. Inst. of Tech., Lexington.
CHARACTERISTICS OF MOON-REFLECTED UHF SIGNALS, by S. J. Fricker, R. P. Ingalls and others. Rept. on Contract AF 19(122)458. 22 Dec 58, 61p. 14 refs. Technical rept. no. 187; AD-204 519.
Order from LC mi$3.90, ph$10.80 PB 146 054

A UHF (412 Mcps) CW bistatic moon-reflection experiment is described in which measurements were made of the total received power, the Faraday rotation, the Doppler shift and the fading rate of the moon-reflected signals. From the results, an effective radar cross-sectioned area of the moon was estimated to be 7×10^{11} square meters. An explanation for the cause of the rapid fading of the signal, based on dynamical considerations alone, gives numerical results that agree well with the measured fading rates. (Author)

Michigan U. Coll. of Engineering, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS 36. DIFFRACTION OF A PLANE WAVE BY AN ALMOST CIRCULAR CYLINDER, by P. C. Clemmow and V. H. Weston. Rept. on Contract AF 19(604)4993. Sep 59, 56p. 10 refs. Rept. no. 2871-3-T; AFCRC-TN-59-955; AD-232 129.
Order from LC mi$3.60, ph$9.30 PB 145 969

The two-dimesional problem of an E-polarized plane wave incident on a perfectly conducting cylinder of almost circular cross section is treated, the maximum deviation of the perimeter of the cross section from a strict circle being regarded mathematically as an infinitesimal quantity whose second and higher powers are neglected. The method of solution uses infinite Fourier transform techniques, but an analysis involving a Watson transformation, more traditional in this type of problem is also given. Various Bessel function results are required, some of which are derived in appendices. Attention is for the most part directed to

the case in which the mean radius is large compared to the wavelength, and the form of the solution then appropriate is examined in some detail. In particular, initial terms of asymptotic expansions in inverse powers of the mean radius to wavelength ratio are obtained both for the specular and for the creeping contributions to the far field. (Author) (See also PB 137 260)

Michigan U. Coll. of Engineering, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS 38. NON-LINEAR MODELING OF MAXWELL'S EQUATIONS, by J. E. Belyea, R. D. Low, and K. M. Siegel. Rept. on Contract AF 19(604)4993. Dec 59, 49p. 6 refs. Rept. no. 2871-4-T; AFCRC-TN-60-106; AD-232 130.
Order from LC mi$3.30, ph$7.80 PB 145 967

Non-linear modeling was accomplished with regard to the simple harmonic oscillator, the non-linear spring equation, Euler's equation, the Boltzmann equation, a general non-linear oscillator equation, and the scalar wave equation. A method is included which shows how to non-linearly model Maxwell's equations by utilizing the non-linear modeling of the scalar wave equation. Despite the a priori expectation that non-linear modeling was at best mathematically very complex, if not impossible, it now appears possible to non-linearly model more difficult equations, such as the coupled set consisting of Maxwell's equations and the Boltzmann transport equation. (Author) (See also PB 145 969)

National Bureau of Standards, Boulder, Colo.
CARRIER FREQUENCY DEPENDENCE OF THE BASIC TRANSMISSION LOSS IN TROPOSPHERIC FORWARD SCATTER PROPAGATION, by Kenneth A. Norton. 12 May 60, 67p. 20 refs. Technical note no. 53.
Order from OTS $1.00 PB 161 554

A further interpretation is given of certain Lincoln Laboratory data obtained in an experiment using scaled antennas as presented in a recent letter to the Proceedings of the I.R.E. from Bolgiano (47, 331 (1959)). This paper has four objectives: first, to clarify the significance of these data from the standpoint of the engineer developing long-range tropospheric scatter systems; second, to apply a further statistical analysis to these data; third, to consider their significance as regards the theory of radio propagation through a turbulent atmosphere; and fourth, to describe a suitable method for the measurement of the meteorological parameters entering the theory. Based on this analysis of the Lincoln Laboratory data, it is concluded that the carrier frequency dependence of the basic transmission loss cannot be variable from hour to hour. (Author)

National Bureau of Standards, Boulder [Colo].
FIELD STRENGTH CALCULATIONS FOR E.L.F. RADIO WAVES, by James R. Wait and Nancy F. Carter. Mar 60, 37p. 26 refs. Technical note no. 52.
Order from OTS $0.50 PB 161 553

The mode theory of propagation of electromagnetic waves at extremely low frequencies (1.0 to 3000 c/s) is briefly reviewed in this paper. Starting with the representation of the field as a sum of modes, approximate formulas are presented for the attenuation and phase constants. At the shorter distances, where the range is comparable to the wavelength, the spherical-earth mode series is best transformed to a series involving cylindrical wave functions. This latter form is used to evaluate the near field behavior of the various field components. The effect of the earth's magnetic field is also evaluated using a quasi-longitudinal approximation which is particularly appropriate for propagation in the magnetic meridian. In general it is indicated that if the gyro frequency is comparable or greater than the effective value of the collision frequency, the presence of the earth's magnetic field may be important for E.L.F. In this case the attenuation may be increased somewhat. The influence of a purely transverse magnetic field is also considered. (Author)

National Bureau of Standards, Boulder, Colo.
QUARTERLY RADIO NOISE DATA, MARCH, APRIL, MAY 1959, by W. Q. Crichlow, C. A. Samson and others. 14 Mar 60, [67]p. 11 refs. Technical note no. 18-2.
Order from OTS $1.00 PB 151 377-2

Radio noise measurements are being made at 16 stations in a world-wide network. The attached tables are based on three parameters of the noise: (1) the mean power, (2) the mean envelope voltage, and (3) the mean logarithm of the envelope voltage. (See also PB 151 377)

Stanford Electronics Labs., Stanford U., Calif.
RADAR MEASUREMENTS OF METEOR ACTIVITY WITH APPLICATIONS TO COMMUNICATIONS, by R. F. Mlodnosky. Scientific rept. no. 7 on Contract AF 19(604)2193. 18 Apr 60, 119p. 30 refs. AFCRC-TN-60-363.
Order from LC mi$6.00, ph$18.30 PB 147 284

From two years of radar measurements of meteor ionization trails, new information has been obtained on the directions of arrival (radiants) of meteoric particles into the earth's upper atmosphere. This information has important application in several techniques of radio communication where information is sent over great distances by means of radio reflections from ionized meteor trails. The contributions of this report include: (1) new experimental results on the meteor radiant distribution; (2) a theoretical explanation of the salient features of this radiant distribution; (3) refinements in a technique of using radar (back-scatter) measurements to determine directional characteristics of forward-scatter, meteor-propagated communications; and (4) actual predictions of diurnal and seasonal variations of propagation characteristics of meteor communication systems based upon the long-term radar measurements.

Stanford Electronics Labs., Stanford U., Calif.
RESEARCH ON POLAR RADIO PROPAGATION BLACKOUTS, by R. D. Egan, A. M. Peterson, and D. S. Pratt. Scientific rept. no. 1 on Contract AF 19(604)4103. 28 Apr 60, 36p. 16 refs. AFCRC-TN-60-187.
Order from LC mi$3.00, ph$6.30 PB 147 360

Polar radio communication blackouts are a frequent result of ionospheric storms, which result from unusual solar activity. The study of communication outages is producing information on the geographical region of communication circuit failure associated with such disturbances. The current report analyzes signal amplitude data taken at Boston and Stanford during August, 1959. Through the use of hourly versus daily contour plots of signal strength and other statistical analysis of the data from each of the circuits involved, it has been found that a major disturbance will produce a communications blackout over the entire western polar region. More localized effects are noted during moderate storms.

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

Columbia U. School of Engineering, New York.
CONSTRUCTION OF ERROR-CORRECTING CODES USING FILTERING TECHNIQUES, by Thomas E. Stern. Technical rept. T-1/M on Contract Nonr-266(60). [1959] 38p. 11 refs. CU-4-59-Nonr-266(60); AD-218 673.
Order from LC mi$3.00, ph$6.30 PB 147 082

Nonlinear filtering techniques are used to develop systematic methods for the construction of close-packed multilevel single error-correcting codes, coders, and decoders. Coding and decoding are achieved through the use of linear modular sequential circuits followed by a nonlinear decision element. The synthesis of an appropriate decoding filter is based upon the selection of a matrix over the modular field GF(p), whose powers display a periodicity with maximal length period. The properties of these matrices are shown to depend upon the properties of the elements of a Galois field, and several theorems from Galois theory are used in the selection of the decoding filter. (Author)

Fairchild Camera and Instrument Corp., Syosset, N. Y.
DEVELOPMENT OF AERIAL DRONE NIGHT PHOTOGRAPHIC SYSTEM, by H. Korth. Final technical rept. for May 56-Aug 58 on Contract DA 36-039-sc-72350. Aug 58, 61p. SME-AB-10; AD-220 357.
Order from LC mi$3.90, ph$10.80 PB 147 020

A summary is presented of the activities involved in the design and development of an aerial night photographic system and its subsequent testing and installation in the drone. With respect to the design of the system, special emphasis had to be placed upon the film speed requirements during the FMC portion of the camera cycle and its coordination with illumination as provided by means of photoflash cartridges. Optical, operational, and environmental testing was performed according to the test specifications. Some difficulties were encountered during low temperature operation, particularly since heaters were not to be employed. (Research Methods--Photographic Equipment, Installation of the camera and its supporting equipment into the drone was accomplished without encountering any unusual difficulties. Development of an alternate motor and cartridge ejection pulse combination in order to enable the camera to operate at higher altitudes was accomplished. (Author)

Naval Ordnance, Lab., Corona, Calif.
FOUNDATIONAL RESEARCH PROJECTS, OCTOBER-DECEMBER 1959. Quarterly rept. [1959] 54p. 33 refs. NAVWEPS rept. 5981; NOLC rept. 487.
Order from LC mi$3.60, ph$9.30 PB 147 512

Contents:
Communication stochastics, by L. T. Long
High temperature polymer program, by C. M. Douglas, D. L. Herring and others
Magnetization reversal studies, by R. L. Conger and J. L. Tomlinson
Semiconductor physics, by D. L. Stierwalt
Small antenna studies, by J. R. Alday and J. G. Hoffman
(See also PB 144 479)

Ramo-Wooldridge, Canoga Park, Calif.
MACHINE TRANSLATION STUDIES OF SEMANTIC TECHNIQUES. Technical rept. no. 1, 21 Apr 59-21 Jan 60, on Contract AF 30(602)2036. 22 Feb 60, 141p. C72-OU4; RADC-TW-60-56.
Order from LC mi$7.20, ph$22.80 PB 146 772

The principal goal of this work is to produce a machine program for automatic translation of Russian into English of usefully high quality and within the framework of that goal to focus particularly on problems of semantics and multiple meaning.

SOCIAL SCIENCES

Applied Mathematics and Statistics Labs., Stanford U., Calif.
COMPETITIVE STABILITY UNDER WEAK GROSS SUBSTITUTABILITY: THE "EUCLIDEAN DISTANCE" APPROACH, by Kenneth J. Arrow and Leonid Hurwicz. Technical rept. no. 77 on Contract Nonr-225(50). 31 July 59, 21p. 7 refs. AD-220 502.
Order from LC mi$2.70, ph$4.80 PB 147 058

Previous studies on the global stability of the competitive equilibrium made assumptions which implied the existence of an equilibrium price vector with all components positive. These restrictions are removed in this analysis by an extension of the Euclidean distance argument. In conjunction with the other assumptions, the square of the distance to any equilibrium is shown sufficient to imply stability even if the equilibrium have some zero components.

Applied Mathematics and Statistics Lab., Stanford U., Calif.
OPTIMAL INVENTORY DEPLETION, by Peter W. Zehna. Technical rept. no. 41 on Contract N6onr-251(26). 24 July 59, 84p. 6 refs. AD-220 507.
Order from LC mi$4.80, ph$13.80 PB 147 063

Optimal LIFO and FIFO policies for depleting stock are analyzed. A condition yielding LIFO as an optimal policy for all n for a convex, twice differentiable function L(s), is proved to be that $\frac{L''(S)}{L'(S)}$ is a nondecreasing function. This condition encompasses the special life functions found by Derman and Klein [Management Sci. 4 no. 4:450-456, 1958], and the theorem is applied to give an immediate generalization. LIFO is found optimal for a concave field life L(S) provided that $L'(S) < -1$ for all S. Investigation of the FIFO policy shows that Lieberman's condition [Management Sci. 5 no 1:102-105, 1958], $L'(S) \geq -1$ yielding FIFO as optimal for L(S) concave and monotone, may be extended to include nonmonotone functions and that for concave functions, the condition is necessary as well as sufficient. It is also proved that whenever L(S) is convex and $L'(S) \geq 1$, then FIFO is again optimal for all n. In the special case $L(S) = a + bS$ ($a > 0$, $-1 < b > 0$), so that $L'(S) > -1$, it is proved that FIFO remains the optimal policy for 2 demand sources. When L(S) is either convex or concave with $L'(S) < -1$ for all S, LIFO is optimal for 2 sources. A general theorem is proved whereby whenever LIFO or FIFO is the optimal policy for 2 demand sources, the same will remain true for any finite number of sources greater than 2.

Applied Mathematics and Statistics Labs., Stanford U., Calif.
SOME REMARKS ON THE EQUILIBRIA OF ECONOMIC SYSTEMS, by Kenneth J. Arrow and Leonid Hurwicz. Technical rept. no. 76 on Contract Nonr-225(50). 23 July 59, 13p. 4 refs. AD-219 878.
Order from LC mi$2.40, ph$3.30 PB 147 057

The following theorem is proved: if the aggregate excess demand functions satisfy the weak axiom of revealed preference, then (1) the instantaneous adjustment process is stable (whether or not there is a numéraire, and (2) the set of equilibrium points is convex. A corollary is given that if all commodities are weak gross substitutes, the instantaneous process is stable and the set of equilibria is convex. Two examples are given of non-unique equilibrium in which the weak axiom of revealed preference holds for the aggregate excess demand functions.

California U., Los Angeles.
A HAND-COMPUTED VERSION OF UCLA EXECUTIVE DECISION GAME NO. 2, by K. R. MacCrimmon and J. R. Jackson. Rept. on Management Sciences Research Proj. Contract [Nonr 233(02)]. 5 May 59, 42p. Research rept. no. 59; AD-218 307.
Order from LC mi$3.30, ph$7.80 PB 147 128

California U., Los Angeles.
MULTIPLE SERVERS WITH LIMITED WAITING SPACE, by James R. Jackson. Rept. on Management Sciences Research Proj. [Contract Nonr-233(02)]. 27 Nov 57, 10p. 6 refs. Discussion paper no. 62.
Order from LC mi$1.80, ph$1.80 PB 137 921

The purpose of the present note is to clarify, for the simples "Poisson-exponential," multiserver systems, the relation connecting the proportion of customers requiring special treatment, the number of waiting spaces in the line, and the ratio of imposed workload to full-utilization capacity of the system. General relations are derived, and computational results are summarized in graphical and tabular form.

Documentation

Benson-Lehner Corp., Los Angeles, Calif.
A SUGGESTION FOR AN IMPROVED DATA BANKING SYSTEM, by Eberhard Weber. Rept. on Contract Nonr-2666(00). 15 July 59, 25p. 2 refs. Research rept. 59-8; AD-225 097.
Order from LC mi$2.70, ph$4.80 PB 147 093

The need for an improved data storage and retrieval system has led to entirely new solutions to the problem. This study has resulted in the suggestion of a parallel-parallel system in which the requirements for improvement were fulfilled. A possible method of implementing this suggested system has been described in terms which, thought not necessarily representative of the ultimate solution, will lead in the direction of the ultimate solution.

Hebrew U., Jerusalem.
SOME THEORETICAL ASPECTS OF THE MECHANIZATION OF LITERATURE SEARCHING, by Yehoshua Bar-Hillel. Technical rept. no. 3 on Contract N62558-2214. Apr 60, 81p. 67 refs.
Order from OTS $2.25 PB 161 547

Data-providing information systems are distinguished from reference-providing systems. References can be provided in (at least) four stages: accession numbers, citations, abstracts, and copies of the documents recommended as pertinent to a request. The problem of false drops loses much of its force for reference-providing in stages. Shortcircuiting reference-providing by directly scanning an encoded document collection with the help of high-speed electronic computers is rejected. Automatic indexing and extracting are criticized as either leading to inferior products or else as being uneconomical. It is also deemed not feasible to mechanize the formulation and reformulation of the request, perhaps in the form of a certain Boolean function over the topic terms, up to the printing of the reference list.

MISCELLANEOUS

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS, June 60.
Order from OTS $1.25, $10.00/year PB 161 282

Contents:

Articles:

Meteorological measurements in the South Atlantic, by Wave Propagation Branch Staff

X-ray photographs of the sun, by Ens. R. Blake and A. E. Unzicker

Review of recent work at NRL on irradiation effects in magnetic alloys, by E. I. Salkovitz and A. I. Schindler

Scientific program:

Astronomy and Astrophysics: Measurements of celestial sources at a wavelength of 10.2 cm. Variable intensity of wind turbulence in the troposphere and in the stratosphere

Chemistry: An improved dc interrupter for use in fundamental studies of electrode reactions

Mechanics: Fracture testing of high-strength sheet materials under conditions appropriate for stress analysis. Effect of chamfered bolt holes on bolts in shear under dynamic loads. NRL three-stage, high-velocity, light-gas gun

Metallurgy and Ceramics: The determination of chlorides in titanium metal. Effect of environment on the creep-rupture properties of aluminum alloys. Low-temperature thermoelectric power of palladium and palladium-nickel alloys containing absorbed hydrogen. The dependence of surface tensions of liquid metals on their energies of vaporization per unit volume. Preliminary neutron-flux survey of core facility at ORNL low-intensity test reactor

Radio: Phase control of high-power amplifiers. Instrumentation for the classification of space signals. Precision time and frequency standards for Naval radio station NPM

Solid State Physics: New thermoluminescent dosimeter has total linear range of eight decades. Energy conversion efficiency of cerium-activated glass. Tables of Einstein energy, specific heat, and derivative specific heat functions

Sound: High-power, transistorized amplifiers for sonar applications

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General

Air and ground inspection techniques for the detection of underground explosive tests. Preliminary report, by R. M. Foose and R. B. Hoy. Stanford Research Inst., Menlo Park, Calif., and Office of Naval Research, Washington, D. C. Jan 59. Decl. Nov. 2, 1959. 131p. Order from LC. Mi $6.90, ph $21.30. ITR-1715

A class of casualty functions with special application to circular targets. Sandia Corp., Albuquerque, N. Mex. Aug 54. 35p. Order from LC. Mi $3.30, ph $7.80. SCTM-32-54-1

Results of a force test of seven configurations of the ultra-altitude vehicle in the Sandia Corporation 12- x 12-inch transonic wind tunnel (program III-43), by J. W. Arnold. Sandia Corp., Albuquerque, N. Mex. Oct 59. 73p. Order from LC. Mi $4.50, ph $12.30. SCTM-324-59(51)

Fixation of fission products. A literature search, by T. F. Davis. AEC Technical Information Service Extension, Oak Ridge, Tenn. May 60. 12p. Order from OTS. 75 cents. TID-3553

Public availability of reports. Abstracted in Nuclear Science abstracts, Book I and II. Technical Information Service Extension, Oak Ridge, Tenn. Feb 60. 618p. Order from OTS. $5.00 per set. TID-4000 (5th Ed.)

Earth stresses and earth strains, by W. R. Perret. Sandia Corp., Albuquerque, N. Mex. Sep 52. Decl. Sep. 29, 1959. 57p. Order from LC. Mi $3.90, ph $10.80. WT-503

Biology and Medicine

Radiological Physics Division semiannual report for July through December, 1959, by J. E. Rose and L. D. Marinelli. Argonne National Laboratory, Argonne, Ill. 1959. Contract W-31-109-eng-38. 127p. Order from OTS. $2.75. ANL-6104

Thermal radiation measurements (Parts I and II). Operation PLUMBBOB preliminary report, by A. L. Greig and H. E. Pearse. AEC Technical Information Service Extension, Div. of Biology and Medicine, Oak Ridge, Tenn. Jan 58. 35p. Order from OTS. 75 cents. ITR-1502

PUQFUA: An IBM-704 fortran code for determining plutonium body burden from urine assays, by J. N. P. Lawrence. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. July 59. Contract W-7405-ENG-36. 33p. Order from OTS. $1.00. LA-2329

Standard-man phantoms, by R. L. Hayes. Oak Ridge Institute of Nuclear Studies, Inc., Oak Ridge, Tenn. Apr 60. 13p. Order from OTS. 50 cents. ORINS-35

Biometric analysis of a growth response of two plant species in a radioactive waste area, by G. L. Plummer. Oak Ridge National Laboratory, Health Physics Div., Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 7p. Order from OTS. 50 cents. ORNL-2903

Semi-annual progress report for July 1, 1959 through December 31, 1959, by Research Staff. University of Tennessee. AEC Agricultural Research Laboratory, Oak Ridge, Tenn. Apr 60. Contract AT-40-1-GEN-242. 55p. Order from OTS. $1.50. ORO-245

Gross beta radioactivity of the algae at Eniwetok Atoll, 1954-1956, by R. F. Palumbo. University of Washington, Laboratory of Radiation Biology, Seattle, Wash. Aug 59. Contract AT (45-1)-540. 32p. Order from OTS. $1.00. UWFL-61(Del.)

Chemistry—General

Chromatographic separation and ultraviolet analysis of polyphenyls, by W. W. West and K. L. Hall. California Research Corporation, Richmond, Calif. Jan 60. Contract AT(11-1)-174. 28p. Order from OTS. $1.00. AECU-4699

The molecular and viscous effusion of saturated vapors, by K. D. Carlson. Argonne National Laboratory, Argonne, Ill. Apr 60. Contract W-31-109-eng-38. 248p. Order from OTS. $3.50. ANL-6156

Specifications for cleanliness requirements. High Level Volatility Lab. 4507, by J. B. Ruch. Oak Ridge National Laboratory, Oak Ridge, Tenn. June 57. 4p. Order from LC. Mi $1.80, ph $1.80. CF-57-6-6

The compound $CuO \cdot 3UO_3$, by J. S. Gill and W. L. Marshall. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 59. 12p. Order from LC. Mi $2.40, ph $3.30. CF-59-8-95

Reactions of hydrogen perocide and ion exchange resins, by E. W. Baumann. E. I. du Pont de Nemours & Co. Explosives Dept., Atomic Energy Div., Savannah River Laboratory, Aiken, S. Car. Apr 60. Contract AT(07-2)-1. 30p. Order from OTS. $1.00. DP-477

Reduction of plutonium (VI) with hydrogen peroxide, by M. N. Myers. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Aug 56. Decl. Nov 23, 1959. Contract W-31-109-Eng-52. 12p. Order from LC. Mi $2.40, ph $3.30. HW-44987

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Use of sorbent beds for transferring hydrogen gases, by D. H. Ahmann, P. S. Flint, and O. N. Salmon. General Electric Co. Knolls Atomic Power Lab., Schenectady, N. Y. June 54. Decl. Mar 13, 60. Contract W-31-109-Eng-52. 24p. Order from OTS. 50 cents. KAPL-1114

The colorimetric determination of boron in zirconium hydride, by G. R. Waterbury and C. F. Metz. Los Alamos Scientific Lab., N. Mex. July 54. Decl. Sep 29, 1959. Contract W-7405-eng-36. 35p. Order from LC. Mi $3.00, ph $6.30. LA-1844

The free energy, heat, and entropy of formation of thorium oxyfluoride, by A. J. Darnell. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. June 60. Contract AT(11-1)-GEN-8. 13p. Order from OTS. 50 cents. NAA-SR-5045

Decontamination testing of highly contaminated protective coatings, by G. A. West and C. D. Watson. Oak Ridge National Laboratory, Chemical Technology Division, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 23p. Order from OTS. 75 cents. ORNL-2811

Controlled potential coulometric titration of plutonium--application to PRFR samples, by W. D. Shults. Oak Ridge National Laboratory, Analytical Chemistry Div., Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 27p. Order from OTS. $1.00. ORNL-2921

The dimensional properties of molded silicone rubbers related to O-ring design, by G. W. Dyckes. Sandia Corporation, Albuquerque, N. Mex. Apr 60. 18p. Order from OTS. 75 cents. SC-4415(RR)

Transparent cold-shock-resistant epoxy casting resin, by B. Carroll and J. Smatana. Sandia Corporation, Albuquerque, N. Mex. Apr 60. 34p. Order from OTS. $1.00. SCR-173

Minutes of the yttrium analytical conference, [held at Argonne National Laboratory], November 7-8, 1956, by C. J. Rodden. Atomic Energy Commission, New Brunswick Lab., New Brunswick, N. J. Jan 57. Decl. Oct 1, 1959. 108p. Order from LC. Mi $5.70, ph $16.80. TID-7533

Chloride complexes of ruthenium (III), by D. A. Fine (Thesis). University of California.

Lawrence Radiation Laboratory, Berkeley, Calif. Feb 60. Contract W-7405-eng-48. 81p. Order from OTS. $2.25. UCRL-9059

Paramagnetic resonance of tetravalent Pa^{231}, by Ru-Tao Kyi (Thesis). University of California, Lawrence Radiation Laboratory, Berkeley, Calif. Mar 60. Contract W-7405-eng-48. 66p. Order from OTS. $1.75. UCRL-9109

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A precise method for determining vanadium in essentially pure vanadium metal, by W. C. Dietrich. Union Carbide Nuclear Co. Division of Union Carbide Corporation, Y-12 Plant, Oak Ridge, Tenn. Mar 60. Contract W-7405-eng-26. 13p. Order from OTS. 50 cents. Y-1294

Chemistry—Radiation and Radiochemistry

Californium production in the high flux isotope reactor, by H. C. Claiborne and M. P. Lietzke. Oak Ridge National Laboratory, Oak Ridge, Tenn. Aug 59. 24p. Order from LC. Mi $2,70, ph $4.80. CF-59-8-125

Protactinium and iodine activities from irradiated thorium, by G. H. Hanson. Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho. June 54. Decl. Nov. 23, 1959. Contract AT (10-1)-205. 3p. Order from LC. Mi $1.80, ph $1.80. IDO-16265

The radiochemistry of americium and curium, by R. A. Penneman and T. K. Keenan. University of California, Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Jan 60. 62p. Order from OTS. 75 cents. NAS-NS-3006

The radiochemistry of rhodium, by G. R. Choppin. Florida State University, Tallahassee, Fla. Jan 60. 32p. Order from OTS. 50 cents. NAS-NS-3008

The radiochemistry of molybdenum, by E. M. Scadden and N. E. Ballou. U. S. Naval Radiological Defense Laboratory, San Francisco, Calif. Jan 60. 38p. Order from OTS. 50 cents. NAS-NS-3009

The radiochemistry of barium, calcium, and strontium, by D. N. Sunderman and C. W. Townley. Battelle Memorial Institute, Columbus, Ohio. Jan 60. 118p. Order from OTS. $1.25. NAS-NS-3010

Second ammonia synthesis test--T-474893. Westinghouse Electric Corp., Atomic Power Div,, Pittsburgh, Pa. July 54. Decl. with deletions Mar 18, 1957. 40p. Order from LC. Mi $3.60, ph $6.30. WAPD-CP-535(Del.)

Chemistry—Separation Processes for Plutonium and Uranium

Spray fluorination of fused salt as a uranium recovery process. A preliminary feasibility study, by J. D. Gabor, and others. Argonne National Laboratory, Chemical Engineering Div., Argonne, Ill. Mar 60. Contract W-31-109-eng-38. 39p. Order from OTS. $1.25. ANL-6131

Chemical Technology Division, Chemical Development Section C, monthly progress report for September 1959, by K. B. Brown and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 59. Contract W-7405-eng-26. 48p. Order from LC. Mi $3.30, ph $7.80. CF-59-8-85

Eurochemic assistance: Information on HAPO instrumentation development, by E. M. Shank. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 59. Contract W-7405-eng-26. 4p. Order from LC. Mi $1.80, ph $1.80. CF-59-10-4

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Improved method for precipitating manganese dioxide, by H. J. Clark, Jr. and others. E. I. dul Pont de Nemours & Co. Explosives Dept. Atomic Energy Div., Savannah River Laboratory, Aiken, S. Car. Feb 60. Contract AT(07-2)-1. 12p. Order from OTS. 50 cents. DP-444

Retention of iodine in process solutions by mercuric salts, by C. H. Holm. Hanford Works, Richland, Wash. June 51. Decl. with deletions July 7, 1959. Contract W-31-109-Eng-52. 22p. Order from LC. Mi $2.70, ph $4.80. HW-21103(Del.)

Improved spectrographic analysis of uranium and plutonium by the carrier concentration method,

by J. L. Daniel. Hanford Works, Richland, Wash. Oct 52. Decl. Oct 7, 1959. Contract W-31-109-Eng-52. 17p. Order from LC. Mi $2.40, ph $3.30. HW-25859

The recovery, purification, and concentration of plutonium by anion exchange in nitric acid, by J. L. Ryan and E. J. Wheelwright. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Jan 59. Decl. with deletions June 25, 1959. Contract W-31-109-Eng-52. 104p. Order from LC. Mi $5.70, ph $16.80. HW-55893 (Del.)

Preliminary chemical flowsheets for the decladding and dissolution of non-production fuels, by M. K. Harmon. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. July 59. 9p. Order from LC. Mi $1.80, ph $1.80. HW-61106

Rates of reaction of irradiated UO_2 and uranium metal with sulfuric acid, by J. L. Swanson. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Aug 59. Contract AT(45-1)-1350. 8p. Order from LC. Mi $1.80, ph $1.80. HW-61482

Plant modifications for reprocessing non-production reactor fuels. Design criteria for fuel element storage facility, building 221-U, by M. E. Yates. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Aug 59. Contract AT(45-1)-1350. 16p. Order from LC. Mi $2.70, ph $4.80. HW-61510

Reprocessing of low-enrichment uranium-molybdenum alloy fuels, by W. W. Schulz and E. M. Duke. Hanford Atomic Products Operation, Richland, Wash. Sep 59. Contract AT(45-1)-1350. 37p. Order from OTS. $1.25. HW-62086

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Dissolution of zirconium and Zircaloy-2 in nitric-hydrofluoric acid mixtures at reflux temperatures, by E. M. Vander Wall, E. M. Whitener and D. L. Bauer. Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho. Sep 59. Contract AT(10-1)-205. 29p. Order from OTS. 75 cents. IDO-14497

The chemical engineering of the radium process. Final report, by H. L. Rawlings. Mound Lab., Miamisburg, Ohio. June 51. Decl. Dec. 2, 1959. Contract AT-33-1-GEN-53. 56p. Order from LC. Mi $3.60, ph $9.30. MLM-609

The tellurium process: I. Application to solutions of bombarded bismuth. II. Application to extracts of residues from radioactive lead dioxide. Final report, by C. L. Rollinson and others. Monsanto Chemical Co., Dayton, Ohio. June 47. Decl. July 14, 1959. 114p. Order from LC. Mi $6.00, ph $18.30. MLM-M-167

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Plant utilities. Technical report, by O. Jenne and R. Winckler. European Company for the Chemical Processing of Irradiated Fuels, Mol, Belgium. [1959]. 14p. Order from LC. Mi $2.40, ph $3.30. NP-7884

Controlled Thermonuclear Processes

Investigation of plasma acceleration, Quarterly progress report for January 1, 1959 through March 31, 1959, by K. C. Rogers and others. Stevens Inst. of Tech., Hoboken, N. J. 1959. Contract DA-36-039SC-78097. 8p. Order from LC. Mi $1.80, ph $1.80. AECU-4344

Quarterly report covering the period form October 1 through December 31, 1959, by K. Bernstein and others. Project Matterhorn. Princeton University, Princeton, N. J. Jan 60. Contract AT(30-1)-1238. 33p. Order from OTS. $1.25. MATT-Q-9

Electrode breakdown and shielding of intense discharges across the magnetic field, by J. W. Flowers. Oak Ridge National Laboratory, Thermonuclear Experimental Division, Oak Ridge, Tenn. [nd.] Contract W-7405-eng-26. 17p. Order from OTS. 75 cents. ORNL-2710

A capacitor monitor for high-energy capacitive storage banks, by J. L. Todd. Sandia Corporation, Albuquerque, N. Mex. Mar 60. 17p. Order from OTS. 75 cents. SCTM-45-60(13)

The hard-core pinch. Part II, by D. H. Birdsall, S. A. Colgate, and H. P. Furth. University of California. Lawrence Radiation Lab., Livermore, Calif. July 59. Contract W-7405-eng-48. 15p. Order from LC. Mi $2.40, ph $3.30. UCRL-5602

Confinement time of a Lorentzian gas in a mirror machine, by G. Gibson and E. J. Lauer. University of California. Lawrence Radiation Lab., Livermore, Calif. Nov 59. Contract W-7405-eng-48. 25p. Order from OTS. 75 cents. UCRL-5696

Numerical computations for self-consistent astron E layer with slowing down of electrons, by T. Seidman. University of California. Lawrence Radiation Lab., Livermore, Calif. Nov 59. Contract W-7405-eng-48. 9p. Order from OTS. 50 cents. UCRL-5789-T

Attainment of 10^{-9}mm Hg pressure in unbaked vacuum systems by molybdenum evaporation, by A. L. Hunt, C. C. Damm, and E. C. Popp. University of California. Lawrence Radiation Lab., Livermore, Calif. Feb 60. Contract W-7405-eng-48. 14p. Order from OTS. 50 cents. UCRL-5889

Enhanced interaction in the positive column, by G. Ecker. University of California. Lawrence Radiation Lab., Berkeley, Calif. Mar 60. Contract W-7405-eng-48. 43 pages. Order from OTS. $1.25. UCRL-9144

Criticality Studies

The analysis of flux-traverse measurements in the GWIN-Magnuson critical experiment, by E. Inonu. Oak Ridge National Lab., Oak Ridge, Tenn. Dec 59. 6p. Order from LC. Mi $1.80, ph $1.80. CF-59-12-2

Program for computing K for uranium salts, by T. B. Patterson. Goodyear Atomic Corp., Portsmouth, Ohio. Nov 59. 5p. Order from LC. Mi $1.80, ph $1.80. GAT-DM-787

Critical mass studies of plutonium solutions, by F. E. Kruesi, J. O. Erkman, and D. D. Lanning. Hanford Atomic Products Operation, Richland, Wash. May 52. Contract W-31-109-Eng-52. 82p. Order from OTS. $2.25. HW-24514 DEL

Minutes of criticality instrumentation meeting, Hanford Atomic Products Operation, August 17 and 18, 1959, by C. L. Brown. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Sep 59. Contract W-31-109-Eng-52. 13p. Order from LC. Mi $2.40, ph $3.30. HW-61931

Effect of neutron interaction on critical size, by J. W. Webster. Phillips Petroleum Co., Atomic Energy Div., Idaho Falls, Idaho. Nov 54. Decl. Mar 4, 1960. Contract AT(10-1)-205. 22p. Order from OTS. 30 cents. IDO-16201

Critical data for nuclear safety guidance, by H. C. Paxton. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. Feb 60. Contract W-7405-ENG-36. 68p. Order from OTS. $2.00. LAMS-2415

Power densities and flux distributions in two special subassemblies, by P. G. Roll. Westinghouse Electric Corp. Atomic Power Div., Pittsburgh, Pa. May 55. Decl. with deletions Mar 8, 1957. 11p. Order from LC. Mi $2.40, ph $3.30. WAPD-P-661(Del.)

Multi-region reactor lattice studies. Quarterly progress report covering period January 1 to March 31, 1960, by I. H. Coen. Westinghouse Electric Corp., Atomic Power Dept., Pittsburgh, Pa. Apr 60. Contract AT(30-1)-2176. 36p. Order from OTS. 75 cents. WCAP-1414

Criticality review of process for fabrication of fuel rods, by J. D. McLendon and J. W. Morfitt. Carbide and Carbon Chemicals Co. Y-12 Plant, Oak Ridge, Tenn. Jan 53. Decl. with deletions May 7, 1957. Contract W-7405-eng-26. 6p. Order from LC. Mi $1.80, ph $1.80. Y-A2-104 (Del.)

Equipment, Methods and Techniques

Hydraulic characteristics of a continuous solvent washer with critically safe dimensions, by H. J. Clark, Jr. and A. Tournas. E. I. du Pont de Nemours & Co. Explosives Dept., Atomic Energy Div., Technical Div., Savannah River Lab., Aiken, S. C. Mar 60. Contract AT(07-2)-1. 11p. Order from OTS. 50 cents. DP-459

Technical investigation of autoclave failure, by N. G. Wittenbrock, and others. General Electric Co., Hanford Atomic Products Operation, Richland, Wash. Nov 59. Contract AT(45-1)-1350. 37p. Order from LC. Mi $3.30, ph $7.80. HW-62715

Geology and Mineralogy

Cyclic pressure tests of large size pressure vessels. Progress report no. 12, by M. M. Lemcoe. Southwest Research Inst., San Antonio, Tex. Oct 59. Contract AT(30-1)-2140. 83p. Order from LC. Mi $4.80, ph $13.80. AECU-4481

Uranium occurrence at the crescent mine, Shoshone County, Idaho, by H. W. Norman. Salt Lake Branch Office, AEC. Grand Junction Operations Office, Salt Lake City, Utah. Dec 58. 18p. Order from OTS. 75 cents. RME-2020(Rev.)

Some uranium occurrences in northern Ferry County, Washington, by J. L. Barlow. Production Evaluation Div., Grand Junction Operations Office, AEC. Salt Lake City, Utah. Oct 58. 22p. Order from OTS. 75 cents. RME-2068

Atmospheric density profiles to 100 kilometers, by B. N. Charles. Sandia Corp., Albuquerque, N. Mex. Nov 59. 9p. Order from LC. Mi $1.80, ph $1.80. SCTM-368-59(51)

Geologic investigations of radioactive deposits. Semiannual progress report for June 1 to November 30, 1959, by W. P. Puffett and others. Geological Survey, Washington, D. C. Dec 59. 123p. Order from OTS. $2.75. TEI-752

Health and Safety

Experimental evaluation of the radiation protection afforded by typical Oak Ridge homes against distributed sources, by T. D. Strickler and J. A. Auxier. Oak Ridge National Laboratory, Oak Ridge, Tenn. Jan 60. 51p. Order from OTS. 50 cents. CEX-59.13

Radiation hazards from recycled reactor fuel, by E. D. Arnold. Oak Ridge National Laboratory, Oak Ridge, Tenn. June 59. 17p. Order from LC. Mi $2.40, ph $3.30. CF-59-6-39

Criticality accident application of the ORNL badge dosimeter, by E. D. Gupton and others. Oak Ridge National Laboratory, Oak Ridge, Tenn. Oct 59. 20p. Order from LC. Mi $2.40, ph $3.30. CF-59-10-41

The sequential analysis of ten nuclides occurring in long range fallout debris, by G. A. Welford and others. New York Operations Office. Haalth and Safety Lab., AEC. N. Y. Mar 59. 43p. Order from LC. Mi $3.30, ph $7.80. HASL-57

Radiobiological studies of the Columbia River through December 1955, by J. J. Davis and others. General Electric Co. Hanford Atomic Products Operation, Richland, Wash. Nov 56. Decl. with deletions July 31, 1959. Contract W-31-109-Eng-52. 177p. Order from LC. Mi $8.70, ph $30.30. HW-36074 (Del.)

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Evaluation of buried conduits as personnel shelters. Preliminary report, by G. H. Albright. Bureau of Yards and Docks. Office of the Chief of Civil Engineers, Washington, D. C. Nov 57. Decl. July 9, 1959. 76p. Order from LC. Mi $3.90, ph $10.80. ITR-1421

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An approximation of radiation dose resulting from an accidental release of tritium gas, by H. L. Rarrick and G. E. Tucker, Jr. Sandia Corp., Albuquerque, N. Mex. Dec 59. 5p. Order from LC. Mi $1.80, ph $1.80. SCTM-406-59-(33)

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A study of the possible relationship between radioactivity and toxicity in fishes from the central Pacific, by P. Helfrich. University of Hawaii, Marine Biology Laboratory, Honolulu, Hawaii. May 60. Contract AT(04-3)-235. 16p. Order from OTS. 50 cents. TID-5748

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The internal environment of underground structures subjected to nuclear blast. II. Effects on mice located in heavy concrete shelters, by D. R. Richmond and others. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex. Sep 59. 25p. Order from OTS. 50 cents. WT-1507

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A photoetching technique for the precision fabrication of waveguide antenna arrays, by R. J. Bittner and E. J. Wilkinson. Sandia Corporation, Albuquerque, N. Mex. Sep 59. Changed from OFFICIAL USE ONLY April 1, 1955. 20p. Order from LC. Mi $2.40, ph $3.30. SC-2974 (TR)

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A study of the high-temperature air oxidation of yttrium metal, by O. N. Carlson, F. A. Schmidt and R. L. Wells. Iowa State University of Science and Technology, Ames Laboratory, Iowa City, Iowa. Mar 60. Contract W-7405-eng-82. 32p. Order from OTS. $1.00. IS-117

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Development of ferritic steels for high temperature sodium service. Part I: 2.25 CR - 1 Mo - 0.4 Cb - 0.4 Ti experimental alloy, by W. C. Hayes and A. J. Birkle. Atomics International. A Division of North American Aviation, Inc., Canoga Park, Calif. May 60. Contract AT (11-1)-GEN-8. 38p. Order from OTS. $1.25. NAA-SR-4832

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The preparation and properties of dispersion hardened uranium powder products. Quarterly Technical report for period ending March 31, 1959, by W. Arbiter. Nuclear Development Corp. of America, White Plains, N. Y. Apr 59. Contract AT(30-1)-2303. 33p. Order from LC. Mi $3.00, ph $6.30. NDA-2112-1

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Bevatron operation and development. XXIII August, September, October, 1959, by W. D. Hartsough. University of California. Lawrence Radiation Laboratory, Berkeley, Calif. Mar 60. Contract W-7405-eng-48. 16p. Order from OTS. 75 cents. UCRL-9058

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Fortran programming techniques for graph plotting on the IBM-704 computer, by C. E. Cohn. Argonne National Laboratory, Argonne, Ill. May 60. Contract W-31-109-eng-38. 19p. Order from OTS. 50 cents. ANL-6161

The diffusion of radioactive fission products from porous fuel elements, by S. D. Beck. Battelle Memorial Institute, Columbus, Ohio. Apr 60. Contract W-7405-eng-92. 25p. Order from OTS. $1.00. BMI-1433

Neutron flux distributions in natural uranium tubes, by T. B. Ponder. E. I. du Pont de Nemours & Co. Explosives Dept., Atomic Energy Div., Technical Div., Savannah River Laboratory, Aiken, S. C. Mar 60. Contract AT(07-2)-1. 28p. Order from OTS. $1.00. DP-467

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The thermal expansion of plutonium metal below 300°K, by T. A. Sandenaw. University of California. Los Alamos Scientific Laboratory, Los Alamos, N. Mex. May 60. Contract W-7405-ENG-36. 23p. Order from OTS. 75 cents. LA-2394

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Thermal shock tests of a plate-type nuclear superheater fuel element design, by R. J. Gariboldi. Argonne National Laboratory, Reactor Engineering Division, Argonne, Ill. Mar 60. Contract W-31-109-eng-38. 14p. Order from OTS. 50 cents. ANL-6086

Some steady-state thermal characteristics of a three-loop reactor power system, by T. R. Bump and H. O. Monson. Argonne National Laboratory, Reactor Engineering Division, Argonne, Ill. Mar 60. Contract W-31-109-eng-38. 22p. Order from OTS. 75 cents. ANL-6137

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Argonne, Ill. Apr 60. Contract W-31-109-eng-38. 39p. Order from OTS. $1.25. ANL-6148

Sodium components test facility. Atomic Power Development Associates, Inc. Detroit, Mich. Nov 59. Contract AT(11-1)-772. 208p. Order from OTS. $3.50. APDA-134

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